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COAL AGE

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December 6, 1923

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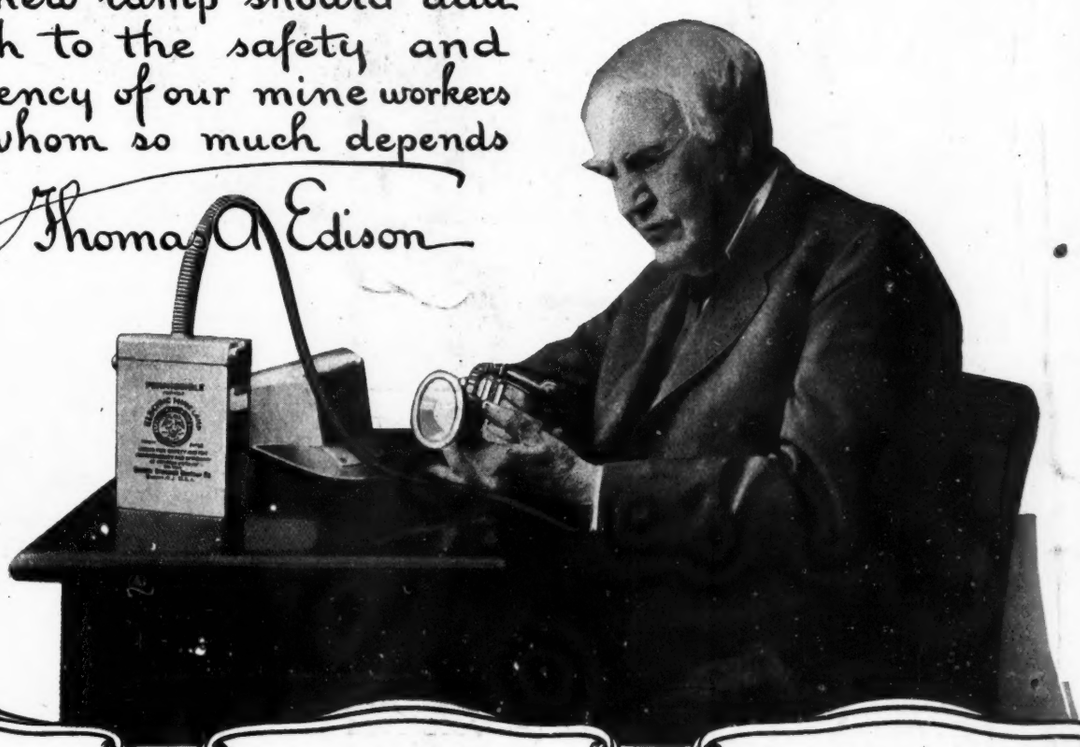

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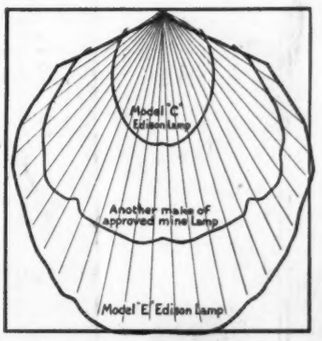

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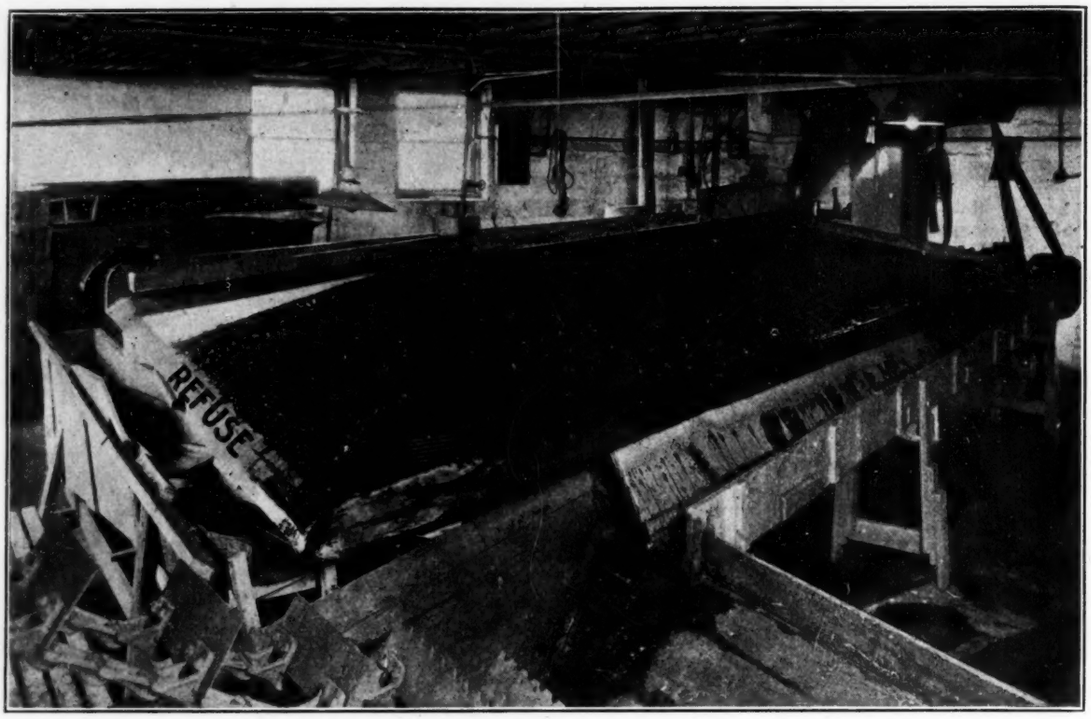

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FORT WAYNE, IND., U. S. A.

COAL AGE

The Only National Paper Devoted to Coal Mining and Coal Marketing

C. E. LESHER, *Editor*

Volume 24 NEW YORK, DECEMBER 6, 1923 Number 23

Lingering Doubt

NO ONE is yet in position to hold unqualifiedly that interstate wage agreements between coal operators and the United Mine Workers are legal. The famous Indianapolis indictments in Judge Anderson's court have been dismissed, it is true, but the air has not been cleared of doubt. There are those who are decidedly of the opinion that the government has not changed its mind as to its original position.

Window-glass producers and hand workers in that industry entered into a wage agreement during the war to maintain wages at a certain level. Their contracts have been renewed from time to time. The federal government has haled them both into court on the charge of having violated the Sherman Anti-Trust law and last month the case was argued before the Supreme Court. In arguing the case Solicitor-General Beck said that the agreement complained of had been entered into for the purpose of enhancing prices and that it imposed *the additional cost of maintaining an industry which worked only a portion of the year.* Sounds much like the charge that is raised against the union coal-mine workers' contract, doesn't it? It furthermore suggests the necessity of forcing, some way, a clear-cut decision on the question of whether coal production, declared by the Supreme Court to be intrastate business, comes under the federal laws which affect interstate business, when producers and miners from two or more states agree on wage contracts. Perhaps a decision in the window-glass case will settle some of these debatable issues.

The New Competition

THIS year has seen the greatest advance in any twelve months in the substitution of oil for anthracite in household heating. A survey made by the anthracite operators shows in New York City alone more than 200,000 tons of anthracite annually replaced by oil in homes, apartments and office buildings. New England has been a fertile field for the oil-equipment people. The coal question in New England is mainly the question of prepared sizes of anthracite. The Northeast Yankee is looking for something cheaper for his furnace than $16 stove coal; hence his willingness to try oil. Already fuel oil has replaced a large tonnage of soft coal in industry in that market.

The anthracite operators have taken hold of the situation. They are going to show the householder something better than oil and cheaper as well—the steam sizes. When everything has been said for the advantages of all so-called substitutes, one finds that on the points of cleanliness, convenience and reliability, anthracite plays second to none. In Philadelphia this week the anthracite operators begin a belated campaign to educate the public to the use of that neglected portion of their necessary output, buckwheat, rice and barley. They have opened a Fuel Economy Exhibit, where will be shown all tried and tested ways of using these cheap sizes of hard coal. The householder will be shown full-sized equipment for utilizing small sizes costing at the mine from $1.50 to $3.50 per ton against $9 for the customary stove coal.

The cost of equipping homes to use this neglected fuel is no more than to install oil. The results are certain to be more satisfying. There will never be a question of adequacy of supply or of insurance. Oil is not the ideal fuel for the home that it is commonly supposed to be. The present fever will subside and by promptly extending their educational exhibits to every large community in the East the anthracite operators may overcome the handicap of a late start. The hard shell of conservatism is cracked.

Congress and Coal

SO ACCUSTOMED has the coal industry become in recent years to having the threat of federal legislation sidetracked in Congress that it is by way of losing interest in the subject. As a subject for action by this Congress, coal must take its place with such live topics as taxation, bonus, wheat prices and the World Court. The prospects for new laws affecting coal are thus obscured, and many for this reason display no anxiety, even though they would deplore any steps toward federal control.

Fulminations against coal will be abundant this winter in Washington, but what we are interested in is the direction that will be taken by serious intentioned legislators. Two are likely, quite probable: Compulsory reporting of the facts on the coal companies' books, and a measure authorizing the President to assume certain control of coal production and distribution during national emergencies.

With respect to compulsory fact finding it is pertinent to point out that the National Coal Association has defaulted on its promise to the Coal Commission to institute voluntary reporting. Whatever excuse or reason be assigned, it remains a default and as such becomes added argument for federal compulsion. There is an important section of the National Association, largely represented in West Virginia, that is opposed to any and all manners of giving the public any facts with respect to its business. These men were primarily responsible for the institution of the Maynard case, and resisted for a long time the Coal Commission's efforts to collect facts. They are those who honestly believe that what they do is nobody's business, and in general they may be expected "to stand on their constitutional rights" in resisting all efforts in that direction.

Strangely enough the United Mine Workers is largely of the same mind, not caring to have the federal gov-

ernment probe too deeply into its affairs. The union will line up behind any program of resisting regulation of coal.

There are, on the other hand, many substantial interests, not all among the organized soft-coal fields, that if not actually favoring complete publicity of their business at least have no objection and will offer no opposition. The opponents are aggressive, hence we may expect the coal industry to give every indication of actively fighting whatever coal measure may be offered in Congress.

Neither of these two broad proposals is a panacea for coal ills, and compulsory fact finding will prove very expensive to the government and a disappointment to the public. Nevertheless, to neither can we find substantial argument in opposition beyond the general one that these proposals or any others, however harmless or ineffective, are but the opening wedge for more drastic regulatory measures. That argument is wearing thin. If the organized resistance of the coal industry can estop such a simple thing as an act to collect and publish currently certain facts about coal, then why cannot that same organized effort more easily prevent more drastic and obviously oppressive measures? The test of the good faith of the operators in going on record in favor of giving the public the facts will be their position on a federal law looking to that end, provided the issue is clearly drawn on that measure.

A Small Corner of a Panorama

STANFORD E. THOMPSON, in his unbiased report on production, of which we publish a part this week, lays stress on the danger of reducing the miner's capacity to earn by poor car supply, and he does not by any means exhaust the arguments against that practice. Much of the miner's disposition to go home early has arisen from the fact that he has become used to a low tonnage and cannot be induced to do more than has for many years been customary. That stint performed he does not see why he should not go home. Thus shortening the stride of the miner to a walk has developed in him a tendency to restrain himself from which he can with difficulty be aroused.

In his study of fewer men and more topping, however, Mr. Thompson lifts but a corner of the sheet, revealing only a small portion of the full panorama. He does not consider what he knows well, that miners go home when they have completed what they consider their stint, that they do not have cars ready always when the gatherers need them, that the problem of railroading is complicated by that fact. Furthermore, he does not recall the fact that the miners do not strike so much because their wages are lower than they ought to be but because they think they should have a rise in wages every so often and because they believe that a labor leader whose platform does not include such a raise is not earning his pay.

Mr. Thompson does not consider what every operator knows, that decisions ultimately rest on political considerations and not on wage earnings. So long as the politicians flaunt the facts and so long as the mine workers continue to win out on the basis of their power to coerce the country, arguments to the operators to give miners a chance to earn more, to go home earlier and to lay off, and so tie up the transportation system, and even to insist on being hauled and hoisted out to the detriment of coal haulage or at risk to their lives, so long will the operator be indifferent. Some blame may be accorded to the mine executive doubtless, but so badly is he imposed upon that he is not prepared to take this loss, and so keen is the competition in union mines that if he takes it his mine is idle, his men are without work and he is made bankrupt.

LaFollette Performs Without Calder

SENATOR LAFOLLETTE has broken out again in an attack on the National Coal Association. He excoriates that organization for its large expenditures, but he does not attempt any comparison with the expenditures of the United Mine Workers, which spent more in salaries alone in six months than did the National Coal Association in a year for all purposes.

Senator LaFollette never has recovered entirely from the unexpected blow he received during the Calder agitation. After Senator Calder had obtained Congressional funds and Congressional support for his committee on the pretense that a study of reconstruction problems was to be undertaken, he launched into an investigation of coal. He thought it would be popular with the public and with labor. Mr. LaFollette was of the same opinion. A coup was sprung and the Calder legislative recommendations were referred to Mr. LaFollette's committee. The coal industry was pilloried to the entire satisfaction of Senators LaFollette and Calder. Just as each was pluming himself to receive the plaudits for their work, in stepped Samuel Gompers, who condemned in no uncertain terms the whole conception. The proceeding was dropped quickly. Soon thereafter Mr. Calder was pulled off the national stage by his own constituents. Mr. LaFollette returns to his attack on the coal industry sporadically, but his old-time enthusiasm has been lacking since the day Mr. Gompers testified.

Siphonic Pumping

SEEING that the siphon works on the principle that falling water will lift other water up a grade by the vacuum it creates, why not use the power of the siphon even when a pump is used? Frequently it is possible to extend the pipe far enough down the hill that the load on the pump will be reduced or even, as in those cases where the lift is less than twenty feet, entirely removed. When the pump discharges underground, extending the pipe line often may enable the siphon to pull or the pumps to drive the water over a second and lower eminence and so save repumping the water from a sump between two summits. Of course, the starting load of the pump would not be decreased but the running load would be, and that is important. Some care to free the line of air should be taken as also some precautions against air leaks, but what efforts are used to this end need not be as painstaking as those which would be taken where the siphon is to operate without a pump.

GIFFORD PINCHOT PITCHED his "compact" scheme for anthracite regulation to the governors last week. Silzer of New Jersey at the bat, hit it over the fence. Pinchot's outfield expects to have retrieved the ball by Dec. 13, when the game will be resumed. Meanwhile the sport writers of the daily press are "knocking" the sportsmanship of Pennsylvania's leader, suggesting that he clean up the tax, miners' law, and other matters at home before passing the buck to the other states.

How Swinging Chutes Are Applied to Thin Seams

In Advancing Face Along the Strike Coal and Waste May Be Delivered by Same Chute or by Two Entirely Different Chutes — Pros and Cons for Working up Pitch or on Level

BY ARTHUR GERKE
Waldenburg, Silesia, Germany

IN *Coal Age*, Vol. 22, pp. 487-489, I discussed the methods employed in the mining of thin seams with swinging, or bumping, chutes where stowing was not employed for the support of the roof. The purpose of this article is to describe the methods as modified when the places mined are stowed as they are worked, but, prior to discussing this matter, it seems advisable to give the reasons why on the Continent of Europe the practice of replacing coal with rock when mining is regarded as being of great importance.

These reasons are the frequent falls of rock in roadways worked without stowing, crushing of the coal seams, heaving of the coal floor, injury to the surface, heavy expenditures for timbering, loss of large quantities of coal in squeezed working places and roadways, the probability of mine fires, the risk of firedamp collecting in the goaf, the danger of extinctive atmospheres or water collecting in the extracted areas and pouring down on the men when working below them in other seams or in lower levels of the same seam.

BACKFILLING HELD ESSENTIAL TO LONGWALL

In many cases the reasons for backfilling will be found to be only indirectly connected with the working methods. Such causes are the possibility of damage to the surface, the scarcity of dumping room and the fear that the rock if dumped on the surface will burn and create a nuisance. An advantage incident to backfilling is that the pressure on the pillars is relieved along headings and galleries permitting them to be more easily kept open and the coal in them removed.

With the use of backfilling the removal of barrier or safety pillars is expedited. The principal advantage, however, consists in being able to operate "broad" or "longwall" workings. "Broad work" usually is laid out as in Fig. 1, the working face being from 125 to 300 ft. long. This face usually moves forward in the direction of the strike, the line of the face following the full pitch of the seam. A swinging chute fixed directly in front of the coal wall serves to convey the coal mined down to the entry.

After a section is mined the swinging chute is moved toward the face so as to leave room for the storage of rubbish. This same chute is then used to take the waste, delivering it where needed. Men stand along this chute and throw the rubbish with a shovel into the section to be filled.

If the mining is to be done by a large gang of men and the roof, or hanging wall, as well as the floor or foot wall, are reasonably solid, a wave will be noted originating in the hanging wall and following directly the cutting of the coal. If the stowing is kept at an appropriate distance from the coal face and if the latter is long enough and is moved along at a quick rate, the coal will be loosened by the pressure and will be the more easily brought down.

To produce that particular effect the face must be of sufficient length or the pressure will not be produced or not be of sufficient force to be effective. These considerations, which apply to all systems of longwall work, have important essentials, the most important being to have as many men as possible in every section and to mine the coal as quickly as can be contrived.

To accelerate coal extraction a miner is provided for

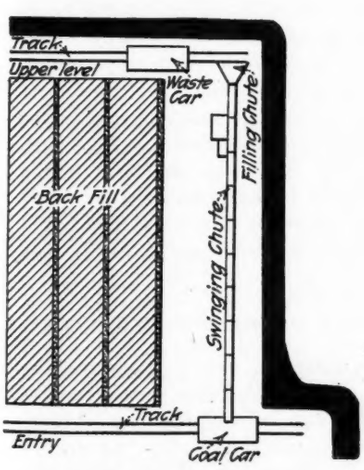


FIG. 1—ONE CHUTE SERVES FOR COAL AND WASTE

With only one chute operation is continually hampered, especially in the early morning when many of the cars are filled with waste that should be unloaded promptly.

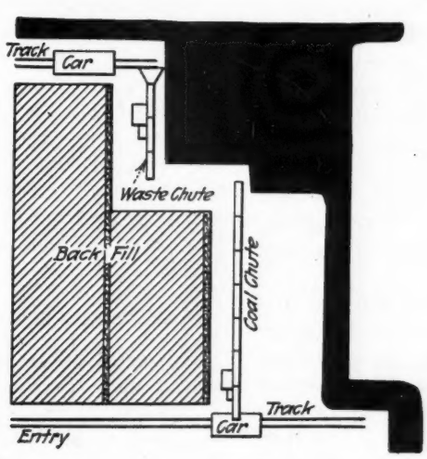


FIG. 2—TWO CHUTES USED BUT FEW MEN CAN WORK

With two chutes waste can be backfilled almost at any time, but, as the chutes are unloaded and loaded only at the extreme end, few men can be employed in driving any one coal face.

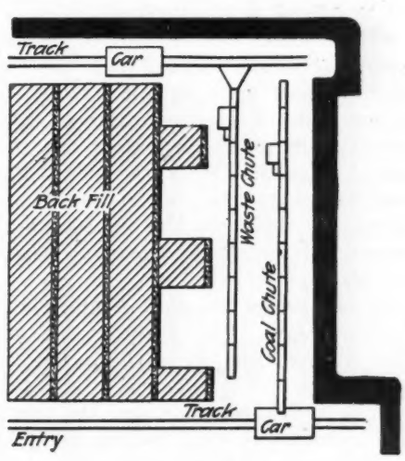


FIG. 3—UNSHORTENED CHUTES; FULL FORCE OF MEN

Here the chutes are laid at full length. Hence waste can be unloaded and coal loaded at any point. At various places outstanding walls may be built rapidly to protect the face.

every 12 ft. of face, and to him that part of the work is assigned. He has to break down the coal and do the timbering. After the coal has been removed from before the face, with the aid of the shaking chute a part of the mined section is filled. For that purpose another swinging chute is used which must be shifted every day if the work advances with sufficient rapidity, as is, of course, the intention. Thus the working face, measuring from 125 to 300 ft. in length, advances every day by the width of one cut—about 5 ft.—if the miners are first-class men and the haulage system does not delay loading. Where the miners are not up to standard they are used at timbering work, in which they soon become specialists.

Concentration Saves Roof Falls and Timber

Owing to the speed with which the coal is won, the action of the hanging wall in such working places noticeably improves; not only is the danger of the roof breaking down close to the face diminished but also the quantity of timber needed to protect the workmen is much reduced.

This method works well if the seams are not too close together and if the hanging wall, as well as the footwall, are reasonably solid. Otherwise, the traveling pressure will not exhibit sufficient force to bring the coal down and may break the cohesion of the roof beyond the working face. Furthermore, if this plan is to be found satisfactory, there must be layers of coal that can be cut with the pick. If these are not found and the coal is so hard that it is necessary to blast it, the mining will not go forward rapidly enough if a single swinging chute has to handle the coal and also the waste by which it is to be replaced.

In consequence, two chutes must be employed and the area kept open in front of the face will have to be both larger and longer maintained, and the result will be that more timber will have to be used. Another serious drawback to success with this class of work is the irregularity with which the backfilling material may be received. On some days there will be a scarcity of rubbish in the mines, unless exploratory headings are being driven. On other days only a small quantity may be wanted in the mine, and the surplus may have to be hauled to the surface.

This trouble can be avoided by introducing a second swinging chute parallel with the face, using it solely for shifting rubbish and restricting the use of the inner chute to the conveyance of coal. The front chute remains in place even after the coal in the cuts has been removed. It is then used for filling until the section where the second chute once stood has been filled. In the meantime the second chute is moved forward to be used for conveying coal during the mining process.

When using two chutes, filling may be done in different ways. Fig. 2 shows the method of filling in the rising direction, where the chute is shortened according to the advance of the filling. This method can be recommended where the roof is sufficiently solid and where, for some reason or other, only a few men are employed at the particular place being worked.

When the face is mined in accordance with Fig. 3 the filling chute always is of full length, and consequently miners or loaders can be located about every 30 ft. As the full length of chute is in front of the area to be stowed they can take the rubbish with a shovel out of the swinging chute at any point they please. This allows advance walls of rubbish to be built at many spots simultaneously, which enables sufficient support to be erected in a short time, a great advantage where the roof is of insufficient strength to support itself over a large area. This method is of special advantage in thick seams.

It is obvious that the use of the second swinging chute increases the equipment, as also the labor cost, a drawback that is, however, more than counterbalanced by the advantages which the duplication confers. Should there be a lack of empty cars, the miners, instead of being unoccupied, can be employed in backfilling until empty cars arrive. Moreover, if no waste material is at hand the men can be employed to undercut and load coal. Thus all the men will be kept working, and to great advantage, because they will be occupied throughout the shift.

If a shaft or inclined plane is to be found near by, sections equipped with two chutes can easily be supplied with empty cars, because the emptied waste cars need only be conveyed to the foot of the working face for filling with coal. In most cases this assures a sufficient number of cars always being available. A still more important advantage in actual practice will be found in the better distribution of the work of backfilling.

At the end of the second shift whatever cars are empty will be taken by the timbermen for use in their work. During the night they load these cars with rubbish and in the morning at the beginning of the early shift these cars are full and need to be unloaded promptly. As fast as they are unloaded they are moved to the discharge end of the chute at the foot of the working face. Here they should be loaded promptly in order to get things moving.

The face is full of coal that the weight has broken down. It is ready to be loaded but would have to wait long if the use of the chute for coal had to be delayed till all the waste in the cars was completely dumped. With two conveyors working—one for waste and one for coal—cars loaded with waste can with minimum delay be brought to the foot of the coal chute, shortening the time during which the loading of coal is delayed.

Nor is this all; with the single conveyor, as the backfilling must be done in cycles and not in any sense concurrently, the line of backfilling cannot be offset and must for that reason be kept near the face. As a result, if coal is ready to load it must be loaded so as to set the conveyor over for backfilling. This may not be at all convenient, for the waste in the morning fills the cars, as they cannot be emptied because there is coal to load before the conveyor can be moved. Yet they must be emptied before there are cars to load the coal.

Car Stealing Unlikely if Filled with Waste

This is an interesting dilemma, only to be solved by having more cars than would otherwise be necessary or by leaving the backfill far behind the face. With two chutes this need not cause delay, for the second chute can be used at all times or all the time for conveying waste regardless of the conditions that may exist at the face. With rope haulage the use of a single chute is quite difficult, for the car supply is discontinuous and long waits may result.

If for any reason an unusual number of cars is needed for a working face, one or several trips filled

with waste toward the end of a shift may be directed toward the area being worked and can be emptied at the beginning of the following shift. It need not be feared that cars full of waste can be taken away by men of adjoining work places, as too often happens with empty cars, especially during night shifts, for the laborers and timbermen who work without sufficient supervision at night can make no use of such cars. With two chutes, therefore, waste is conveyed with far greater regularity than with one only, and time is saved in the end even though there is a loss in moving two chutes instead of one.

Where the joints of the seam run in the direction of the strike it would not be well to choose what is known as "broad work," as it would not be possible to utilize the joints in the mining of the coal.

It should be said that a further disadvantage in mining in the direction of the strike is that the seam often contains rolls where the coal thins and that there are other similar disturbances that affect extraction. As such displacements generally run more or less diagonally through the seam, the face exhibits this roll or spar as an open wound so long as it is being worked. At the point of disturbance excess pressure may be experienced, and often bottom must be lifted to make room for the swinging chute. As the work progresses, the pressure moves along the face and consequently an unusual quantity of timber is required and some damage is done.

Ways there are of meeting these difficulties. The stowing may be done with greater promptitude and carried nearer the face or the entry may be driven to the limit and worked on the retreat. But whatever may be done, wherever such rolls occur, there always will be interruptions and roof falls that involve much expense, these difficulties continuing until the place is finished.

Some Conditions Favor Working Upward

In such cases a method is employed with advantage which is based on the rising longwall system of earlier days but which is readily adapted to use with swinging chutes. It is true the inclination must be steep and the seam not too thin or the waste will be conveyed with difficulty. Fig. 4 illustrates this method in which the seam is worked in a wide breast and to the rise. In some cases the face is placed at a greater angle to the strike than is shown in Fig. 4, so as to increase the inclination of the chute.

In opening up the workings by this system one or two entries—one of which is shown in the illustration—are driven on the strike from the main tunnel by which the seam is approached from the shaft, which tunnel is not shown. At distances of 660 ft. or less, airways are driven straight up the pitch to an upper level, the interval between these places being twice that of the longest face it is purposed to operate.

It is not well to make any one face longer than 330 ft. The entries should be driven through to the limit before starting to open the faces, but this is not always done. The working of any or all the faces may start at the same or at any convenient time.

The working face is opened as follows: At the side of this airway a narrow cut is made from the entry. A second and shorter rise is made 15 ft. or more therefrom, the distance depending on the number of men available. The next rise is started at the same distance but is extended a shorter distance, and this is continued

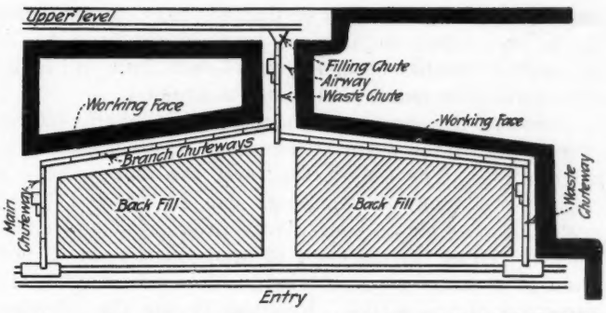


FIG. 4—WORKING THE COAL STRAIGHT UP THE PITCH
The waste and timber may be brought in from the upper level or may be hauled up the center airway by a hoist driven by electricity or compressed air.

until a point 330 ft. from the original chuteway is reached.

The faces of the various rises are arranged to be at an angle 8 to 10 deg. from the line of the strike. When this composite face has been completed a chute is placed in front of it, and work advances in the direction of the pitch. The coal may be conveyed to the entry in many ways, and the method employed in bringing in rubbish also may be varied. Of course, the waste need not be brought in if enough rock falls in the seam or if the rubbish need not be built up solidly.

In the method shown in Fig. 4 waste is unloaded from a car in the upper level into a filling chute by which it is conveyed to a swinging chute in the airway. By giving this chute less inclination than the full pitch of the seam the chute can be caused to deliver to either of the face chutes without the necessity for any excavation in the bottom of the seam. Thus the waste, as also the timber, is brought in from above. However, some bring it up the center airway on an inclined roadway in which the bottom must be lifted if the cars are too high to travel in the seam. A small hoist serves to pull up the cars.

As will be seen, the coal is dumped in a swinging chute in front of the face, which in turn dumps into another chute which descends at one end of the face from the face chute to the car at the entry. This chute may also carry the coal brought to it by the chute stationed in front of a neighboring face.

Why Advance to Pitch Is and Is Not Favored

Thus by one working method two chutes and two small hoists worked with compressed air or electricity are needed. The costs that must be met in this method are saved by the other plans where the longwall is advanced in the direction of the strike and the face lies parallel to the pitch. Other disadvantages of the method with the hoist is that it is in itself objectionable as moving it is troublesome and expensive, that disturbances running in the direction of the strike cannot be evaded and that the maintenance of this inclined plane and of the air connection leads to expense. Replacing the chute also is difficult in a seam with much inclination.

Though these drawbacks cannot be denied they are compensated for by considerable advantages. In the first place the opening of the longwall is much simpler, for we can dispense with the roadways driven between the two levels to subdivide the area, thus saving the expense of maintaining them. If, however, a haulage road has been driven as an upper level we can dispense with the incline. If it is not necessary to bring in waste from other places or if the road for convey-

ing waste is high enough so that the cars can be tipped in it, then again an inclined road is not needed. As a result a number of men are relieved from unproductive work and much timbering is avoided.

Above all it must not be forgotten that by this method the output of the seam is increased in a comparatively short time. The longer the level the more places at which new longwall workings can be started. This makes it possible to concentrate production and consequently reduce the quantity of unproductive work more than is possible when the longwall is advanced in the direction of the strike. Needless to say the traveling pressure will exhibit itself here as in the other method and facilitate mining if the cutting is done quickly.

Each Fan Airs Part of Mine, but Either Can Relieve the Other

Royal Mine Protected by Automatic Doors That Open and Close When Either Fan Shuts Down, Giving All Workings Reduced Current

BY S. TESCHER
General Superintendent, the Royal Fuel Co., Denver, Colo.

NO FAN idles at the Royal Mine waiting, like an understudy, for the failure of the main fan. Two fans are kept busy, each ventilating its own separate area of the mine, and if one fails the other takes up the burden, the doors being hung so as to open or close when the direction of the current shows signs of changing. The fans thus relieve one another without reversing the direction of the current in the principal roadways. Returns remain returns, and intakes remain intakes. All the energy of the moving current is retained, and the air continues to travel with only slightly decreased volume and velocity. Thus the addition of a second fan means not only additional safety but more air without an equivalent power consumption.

This fan installation and a new airshaft were completed Sept. 1, 1923, by the Royal Fuel Co. at its Royal Mine, Aguilar, Colo. The installation gives this property two ventilating fans, each delivering air by a separate intake and a separate return to a different section of the mine. By means of a bypass entry, which allows either of the two returns to go to either of the two fans, and by a system of doors and overcasts, either fan in case of disability can be made to ventilate the entire mine without any serious interruption to the ventilating current.

The new shaft has two compartments, the inside measurements of each being 9 ft. 6 in. x 9 ft. 11¼ in. The depth of the shaft is 404 ft. The new shaft is located 1,600 ft. west of the present hoisting shaft, which is just that much closer to the working places.

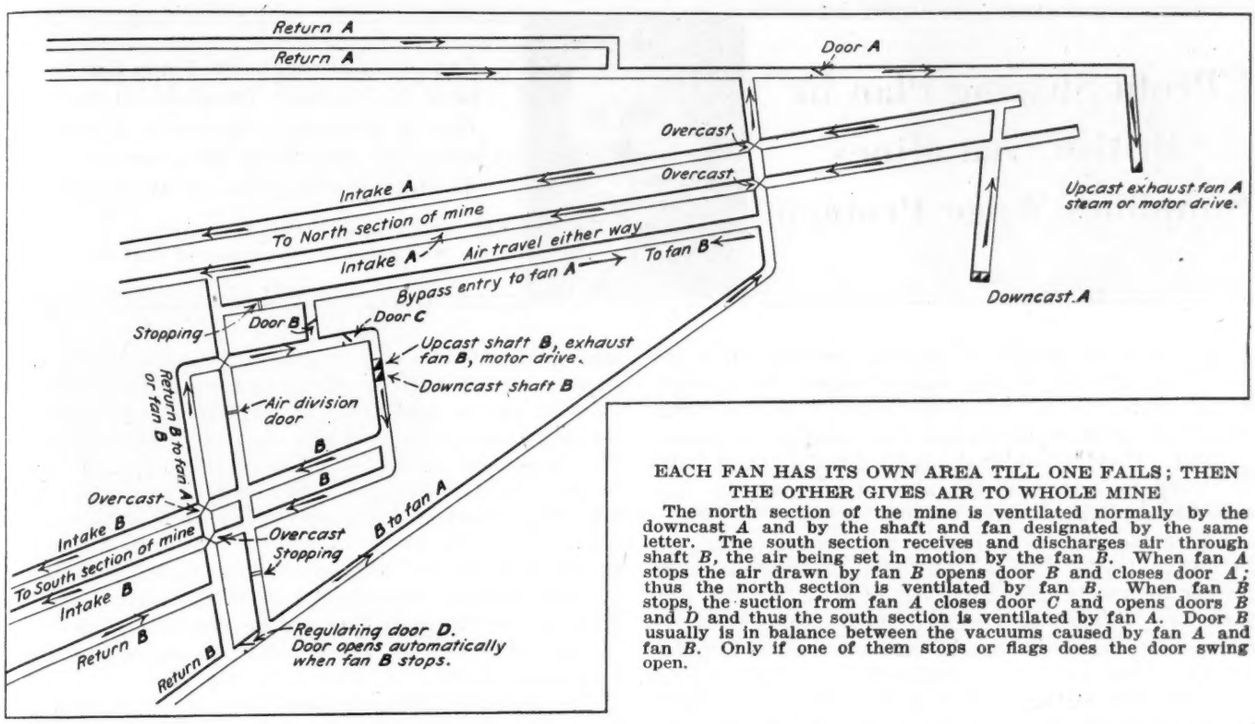
The shaft is lined with 4x12-in. Oregon fir, tongued and grooved and surfaced on four sides, with the exception of a 22-ft. concrete collar at the surface and a 13-ft. concrete base near the landing. One compartment of this shaft is used as an intake or downcast, and the other is used as a return or upcast. The upcast compartment is connected by a steel housing to a double-inlet reversible Sirocco fan, which is driven by a 200-hp. motor equipped with a semi-automatic controller. The new fan can be started or stopped from the hoist house, where a man is in attendance 24 hours per day.

An automatic signal system rings a bell at the hoist house as well as in the mine, if the fan stops or its speed is reduced to any appreciable extent. The motor driving the fan is of ample size to take care of any overload and will keep the fan in operation under single-phase current.

Prior to the installation of the new fan and airshaft the old fan, which may be operated by either steam or electricity, ran at a speed of 300 r.p.m., consumed 107 hp. and delivered 96,000 cu.ft. of air per minute at a 4.5-in. water gage. Since the installation of the new fan the old fan has delivered 85,000 cu.ft. of air per minute to its section of the mine at a 3.7-in. water gage, it being driven at a speed of 270 r.p.m., and consuming about 75 hp.

The new fan, running at a speed of 250 r.p.m. and consuming about 75 hp., is delivering 100,000 cu.ft. of air per minute to its section of the mine at a 3-in. water gage. In other words, the total quantity of air coursing through the mine has been practically doubled, though the power consumption has been increased less than 50 per cent. To have doubled the quantity of air coursing through the mine without some such change

PANORAMA OF THE ROYAL MINE AT AGUILAR, COLO., SITUATED IN



EACH FAN HAS ITS OWN AREA TILL ONE FAILS; THEN THE OTHER GIVES AIR TO WHOLE MINE

The north section of the mine is ventilated normally by the downcast *A* and by the shaft and fan designated by the same letter. The south section receives and discharges air through shaft *B*, the air being set in motion by the fan *B*. When fan *A* stops the air drawn by fan *B* opens door *B* and closes door *A*; thus the north section is ventilated by fan *B*. When fan *B* stops, the suction from fan *A* closes door *C* and opens doors *B* and *D* and thus the south section is ventilated by fan *A*. Door *B* usually is in balance between the vacuums caused by fan *A* and fan *B*. Only if one of them stops or flags does the door swing open.

in the system such as provided would have been impracticable, as it would have required over 800 hp.

Gas analyses taken at three different points on the return aircourses prior to the new installation gave 0.9, 1 and 1.5 per cent methane respectively. Gas analyses taken after the new installation at these same points gave 0.4, 0 and 0.6 per cent methane, respectively. The absence of methane in the second sample is due to its having been taken out of the intake air before that air had entered the mine far enough to be contaminated.

Tests made at the mine after the new fan was installed show that if the new fan is stopped, the old fan automatically picks up a portion of the load of the new fan. On one occasion the new fan was shut down for 30 minutes. At the end of that time changes were made which allowed the old fan to ventilate the entire mine, and mine officials reported no change in the most gaseous working places. The changes consumed about 15 minutes and were made, as stated, without a total stoppage of the ventilating current.

In the planning of this new ventilating system the direction of the air in the mine was in no place changed. This proved to be an important factor, as the air travel is aided by differences in temperature. The two fans are now capable of delivering over 250,000 cu.ft. of air without overloading their present driving equipment.

Four important factors entered into the improvement of the ventilation as above outlined: Shortening the distance of air travel by locating both the new intake and new return closer to the working faces; reducing the total volume of air passing in the old intake and old return by dividing the mine into two sections; placing of two additional splits in the air current; and installing an additional ventilating fan.

IN THE MOUNTAINOUS REGION OF LAS ANIMAS COUNTY

Profit Sharing Plan in British Coal Mines Simplifies Wage Problem

Coal Age Correspondent Finds Enterprise No Longer Penalized—Labor Now a Partner — Workers Interested in Effecting Economies — Change in Attitude Toward Machinery

By Paul Wooton
Washington Correspondent of *Coal Age*

DESPITE its popularity among operators in South Wales, the old sliding scale of wages, based solely on the price of coal, is not desirable, I learned from discussion with students of this subject in Great Britain. They believe that profits form a better basis on which to determine the amount the industry can afford to pay labor.

Under the sliding-scale plan the tendency was, for the wage to decrease as the output would increase. Rather than work themselves out of a job, the coal diggers were inclined to withhold their best efforts. In most cases the result was to penalize their enterprise. On the other hand, the sliding scale worked out inequitably for certain mines, particularly those where the relative cost of production was high. The rate of pay was uncertain and the men had little interest in avoiding waste.

By ascertaining what the operation can afford to pay, and by basing the wage on the profits, labor becomes a partner in the enterprise. Experience in Great Britain has been that the interest of the men in effecting economies is aroused at once. A workman who is wastefully inclined is held in check by his fellows. The plan is beset with difficulties, but none of them is regarded as insurmountable. Each month is seeing some progress in the effort to iron out these difficulties.

Viewpoint Changed on Machinery

Under the profit-sharing system, labor occupies a different viewpoint with regard to the use of coal-cutting machines and other mechanical devices which make for economy in mine operation. They increase the profits of the men. The best authorities on coal in Great Britain believe that a material increase in the use of labor-saving devices may be expected from this time forward. There are physical reasons, however, which will preclude the use of cutting machines to the same extent that they are used in the United States.

England and Wales have a great asset in the fact that most of their miners are of British birth. Poles and other foreigners have been introduced into the mines of Scotland with resultant troubles. Experience there as well as in the United States has convinced British operators that it is wise to seek their labor at home. As it is, the mine worker in England is a substantial citizen. He has ideas and opinions of his own. He reads and is well versed in the trend of public affairs. As a result he is not led far astray by false prophets. He is willing to play the game and there is strong sentiment for living up to all agreements.

There is no hope that accord ever will be reached as to what constitutes a fair minimum wage, a feature of the coal treaty, which, in the words of Prof. James A. Bowie, of the Manchester School of Technology, "was thrust like a ramrod into the delicate mechanism of the agreement at the last minute." Despite Professor Bowie's caustic criticism of the agreement itself, which he describes as imperfect and superficial, he nevertheless is outspoken in his belief that the principle which the agreement attempts to apply is sound. In fact he declares it to be "the most hopeful and comprehensive experiment in industrial relations that has been made during the present century." He calls attention to the fact that the coal agreement of 1921 comprises the first definite democratic pact in the history of the British coal industry, "embodying objectively the subjective principles on which collective bargaining had confusedly worked."

The operators are convinced that the minimum wage is too high and the men believe it is too low. The lack of accord is understandable, however, since employer and employee always have had divergent views on that subject. The minimum wage is the most troublesome feature of the present agreement, but there is little danger that it will wreck it, as some have predicted. The fact that the plan is an arrangement within the industry and is not handed down from above appeals to both operators and men. The scheme is proving to be a splendid antidote for socialism, which had gained a considerable following among British workers.

In discussing employer-employee relationships with this correspondent, a titled Englishman made the point that labor once was the slave of the master. The world progressed and the laborer became a wage earner. Another epoch now is dawning, this Englishman declared, in which the laborer becomes a profit-sharer. This is the secret, he thinks, of restoring productivity.

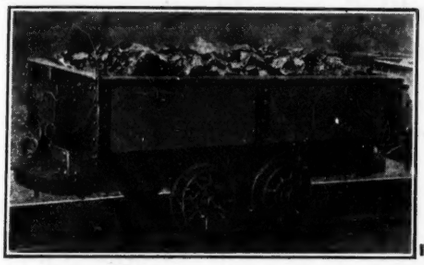
Scientific Loafing Passing

Formerly labor became much more efficient during periods of unemployment. Since the war, however, the existence of large masses of unemployment has not tended so decidedly to such a result. The sentiment which governs in non-profit-sharing industries is one prompting the men to do as little as is possible in order to make way for more workers. The viciousness of such a policy is apparent in nearly all trades. Costs have been inflated to the point where production is limited greatly, with the result that unemployment continues on a larger scale than otherwise would be the case.

All of this has a direct bearing on the world coal situation, since the abnormally low industrial demand in the United Kingdom forces more British coal on the export market in competition with American and other coals. Moreover, the situation is one that is encountered in the United States with each dip in the curve representing industrial activity.

Next week Mr. Wooton writes of labor and labor leaders in the British coal industry.

Too Many Miners—What That Means to Themselves, The Operators and the Public



Well-Topped Cars May Save a Cent or Two per Ton in Haulage but May Make an Eighteen Cent Increase in Mining Rate Equitable

AT ONE of the mines visited by the engineers of the U. S. Coal Commission the general superintendent, who had charge of a number of large mines, stated that notwithstanding the fact that the miners were at present losing time waiting for cars, he planned to raise his output by increasing the number of loaders 50 per cent, thereby cutting down still further, by 33 per cent, the number of cars delivered to individual miners.

He said that in consequence of this proposed action the miners would be obliged to put more coal in the cars in order to earn the wages they were receiving, and with better filled cars the haulage cost would be lowered. In these mines the men were paid by the ton and not by the car. Furthermore, if under the new schedule some of the miners were absent he could give some of those who were in, 50 per cent more cars, and they would readily make up for the tonnage of the men who were out. In this way he could maintain his production. He could do this, furthermore, without breaking the letter of the "square turn" agreement with the union.

Balance Losses of Miner Against Gains

It is of interest to note the relative effect in money losses to the miner and in apparent gain to the operator of extreme topping of cars, that is, piling up the coal above the top by careful stacking of lumps around the sides. Although a special case, this is of interest as illustrating the general principles involved in delays in work which is on a piecework basis.

In the mine to which reference is made 85½ per cent of all the coal produced was being loaded in rooms by men who frequently waited for cars and were expected to top them to the maximum height, whereas 14½ per cent was being loaded by men working in gangs in entries where the company was pushing the work. There they received all the cars they wanted, the purpose being to get out a big piece-rate tonnage. These heading men were not required to top their cars. In order to simplify consideration of the subject the figures have been reduced to a basis of 1,000 cars, and assuming each car to hold one ton when topped, the results of actual loading during a representative eight-hour day for these two groups of men are given in the following tables in order to show the loss in tons of production due to a failure to top to the maximum height. This is based on direct observation of one day's work, except that the actual number of cars and their capacity has been converted for simplicity in figuring into their equivalent of 1,000 one-ton cars.

It will be seen from this table that with the conditions existing in this mine, where the miners are in rooms frequently waiting for cars and where the management requires the miners to top their wagons, the cars loaded and hauled are topped to an average of 91 per cent of capacity. On the other hand, in entries, where the miner was not kept waiting for cars and was not required to top them, the miners loaded 200 tons less than the cars would have carried if topped to capacity. This is only 80 per cent of the topped capacity instead of the 91 per cent that obtains where the cars are loaded in rooms.

Change Does not Apply to Entry Miners

The decrease proposed by the management in the number of cars delivered to each miner applies only to miners in rooms, as the men driving entries will still be given all the cars they need. Allowing for the separate loading of bug dust, which cannot be topped, and for cars partly filled when cleaning up a cut, it is fair to estimate that the cars in rooms will be loaded to an average of 97 per cent of capacity if the supervision is close and the miners are compelled to wait still longer for cars. With this assumption the total cost of haulage and hoisting labor per ton will be as shown in Table II.

From these figures it is seen that the extreme saving to the company between the conditions of giving all miners all the cars they can load without requiring

TABLE I—LOSS OF OUTPUT BY LOW TOPPING

Loading in Rooms			Loading in Entries		
No. Cars	Percentage of Maximum Topped Capacity	Loss in Tons Due to Failure To Top To Capacity	No. Cars	Percentage of Maximum Topped Capacity	Loss in Tons Due to Failure To Top To Capacity
167	100	20	0	100	0
528	95	6	71	95	3
174	85	26	413	85	62
87	75	22	485	75	121
25	65	9	10	65	3½
9	55	4	10	55	4½
8	40	5	10	40	6
998	91	92	999	80	200

Fifth installment of report on "Underground Management in Bituminous Mines" made by Stanford E. Thompson and associates to the U. S. Coal Commission. Previous installments may be found in the issues of Nov. 8, p. 691; Nov. 15, p. 733; Nov. 22, p. 773, and Nov. 29, p. 811. Other sections of this interesting report will follow later.

topping and giving all the miners less than two-thirds of their carload capacity and requiring topping is the difference between 29.5 and 24.5, the entry and the room costs, or 5c. per ton.

There is further indirect saving to the mine operator by decreasing overhead per ton with increasing production and also by increasing the regularity of operation, as already has been indicated. The maximum real saving in labor, as shown by the table, however, is only 1.5c. per ton. This direct saving to the management is offset not only by increased expense for track and timbering but by greater and more insistent demands by the miner for deadwork allowance, about which he is much more contentious when he has much idle time.

TABLE II—EFFECT OF TOPPING ON HAULAGE COST

	Present Arrangement			After Reducing Cars 33 Per Cent		
	Room	Entry	Total	Room	Entry	Total
Per cent of total mine output	85.5	14.5	100	85.5	14.5	100
Per cent of mine-car capacity loaded	91	80	89.3	97	80	94.5
Total haulage and hoisting labor cost per ton	26.0	29.5	26.5	24.5	29.5	25.0

This, then, is the saving to the operator. It is well to look now to the effect of such methods on the miner. He is faced with the unchangeable schedule of union rates under which the miner is paid the same rate per ton whether he can mine one, ten, or twenty tons. With an average loading of six 2-ton cars, or twelve tons per day, for which he is paid 84c. per ton, he earns under the conditions of present car supply, $10.08 per day, but when this is reduced one-third or to four 2-ton cars, the maximum he can load in a day (allowing for the extra topping and ratio assumed) is only

$$4 \times 2 \times \frac{97}{91}, \text{ or } 8.53 \text{ tons.}$$

This gives him, at 84c. per ton, $7.16 a day against the $10.08 formerly earned. Thus he loses $2.92 a day. If the tonnage rates were immediately corrected to make up to the miner the loss in daily earnings, as is indeed sure to come to pass ultimately, it would be necessary to raise the rate per ton from 84c. to $1.01½. This would represent an increase in the cost of mining labor of 17½c. per ton against a saving in haulage labor cost of 1½c. per ton.

The superintendent, however, knows that the men are working under definite rates which by the union agreement cannot be changed prior to April 1, 1924. If the idle time of the men were directly reflected in costs, it is inconceivable that any company would adopt a policy which would result in increasing that loss. Eventually, however, this increased cost would be borne by the company in increased rates per ton, and in turn would be passed on to the public. Such things as these indicate the need of analyzing the costs of mine-car loading and haulage so as to reach just and scientific solutions of the questions which are of such major importance to the industry.

IN THE ANTHRACITE REGION rock is frequently being loaded by compressed-air shovels, thus removing from the shoulders of the miners the burden of mucking. The operation being purely mechanical there is no necessity to give the shovel spells for rest, which with manual labor are necessary and tend to stretch out so unduly that work is the exception rather than the rule.

Examination Questions Answered

Solutions to Queries Involving Ventilation Problems

QUESTION—*What pressure will be required to pass 150,000 cu.ft. of air per minute in the following splits or airways: Split A, 8x10 ft., 3,000 ft. long; split B, 7x12 ft., 4,000 ft. long; split C, 8x8 ft., 2,000 ft. long. Find the horsepower on the air at the mouth of each split.*

ANSWER—The solution of this question depends on the principle, in splitting air currents; namely, the quantity of air passing in each split is proportional to the potential factor of such split as determined by the expression $X = a\sqrt{a/s}$. For the sectional areas and rubbing surfaces of the several splits we have

Split A, $a = 8 \times 10 = 80$ sq.ft.;
$s = 3{,}000 \times 2(8 + 10) = 108{,}000$ sq.ft.

Split B, $a = 7 \times 12 = 84$ sq.ft.;
$s = 4{,}000 \times 2(7 + 12) = 152{,}000$ sq.ft.

Split C, $a, = 8 \times 8 = 64$ sq.ft.;
$s = 2{,}000 \times 2(8 + 8) = 64{,}000$ sq.ft.

For the several potential factors of these splits, we have

Split A, $X = 80\sqrt{80/108{,}000} = 2.1773$
Split B, $X = 84\sqrt{84/152{,}000} = 1.9748$
Split C, $X = 64\sqrt{64/\ 64{,}000} = 2.0239$

Sum of potentials $\Sigma X = 6.1760$

The pressure-producing circulation is found by dividing the total quantity of air in circulation by the sum of these potential factors and multiplying the square of this result by the coefficient of friction, which gives for the unit pressure in this case

$$p = k\left(\frac{Q}{\Sigma X}\right)^2 = 0.00000002\left(\frac{150{,}000}{6.176}\right)^2 = 11.8 \text{ lb. per sq.ft.}$$

The total horsepower producing the circulation is

$$H = \frac{150{,}000 \times 11.8}{33{,}000} = 53.6 \text{ hp.}$$

The power on the air at the mouth of each split is proportional to the potential factor for such split; thus,

Split A, $6.176 : 2.1773 :: 53.6 : x = 18.90$ hp.
Split B, $6.176 : 1.9748 :: 53.6 : x = 17.14$ hp.
Split C, $6.176 : 2.0239 :: 53.6 : x = 17.56$ hp.

Total 53.60 hp.

QUESTION—*A rectangular airway is 6 ft. high, 12 ft. wide and 2,500 ft. long; what is the rubbing surface in square feet?*

ANSWER—The perimeter of this airway is $2(6 + 12) = 36$ ft., and the rubbing surface is, therefore, $2{,}500 \times 36 = 90{,}000$ sq.ft.

QUESTION—*What is the maximum distance required by the mine law, for crosscuts to be from the working faces of chambers, headings and airways?*

ANSWER—The law requires (Art. 10, Sec. 15) that headings or crosscuts shall not be driven more than 60 ft. from the face of each chamber or breast.

Washer That Removes Refuse in Coal as It Travels

Raw Coal Is Swept by Water Along Troughs—Slate and Bone Stratify Out and Are Trapped in Slots Which, by an Upward Current of Water, Are Kept from Admitting Coal

By Joseph Kersten*
Consulting Mining Engineer, Brussels, Belgium

THOUGH coal is washed in many ways, in all of them gravity has its effect. When a body falls in space that is filled with a fluid—liquid or gas—the velocity of its descent is diminished by the resistance of the fluid to displacement, and the denser the fluid the greater is this resistance. As the density of water is 800 times that of air, this diminution in velocity is of no little importance, in fact it may be calculated that the speed of the falling, or sinking, body rapidly reaches a maximum, after which its downward velocity becomes constant.

But the size of the falling particles also influences the velocity of sinking and in consequence a particle of any given specific gravity may fall at the same rate as one of a totally different specific gravity provided the size is such as to compensate for the difference in density.

Mathematical calculations show that during the first part of the fall, during which the velocity is accelerated,

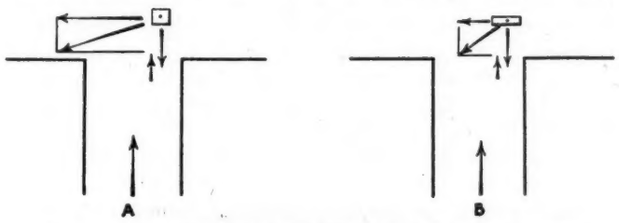


FIG. 1—ONE REASON WHY THE SLATE IS TRAPPED

In sketches *A* and *B* are shown pieces of coal and slate respectively. In actual practice the slate would be working its way near the bottom of the trough. Here, however, both are at the same level. The coal, being cubical, gets the full sweep of the current and is less disposed to fall than the slate because of its low specific gravity. Consequently the resultant of the forces on the coal is more nearly horizontal than the resultant of the forces on the slate. Furthermore, the coal is moving rapidly as it approaches the slot and the slate is not, and hence, as in the Emery picker, the coal ignores the slot and passes on.

the particles are sorted, or, as it is technically termed, classified, according to specific gravity, but during the period of the fall at constant velocity, the speed of the descent depends not only on the specific gravity but on the size. When these two elements compensate one another, the classification is according to equal settling qualities, or "equivalence," as it is termed, and not according to specific gravity. This is a consideration that must not be overlooked.

Of course the sorting according to specific gravity is the only separation that will divide the coal satisfactorily according to its ash and pyrite content. A means of separation known as the Rhéolaveur (Ray-oh-lah-ver), or flow washer, has been devised by A. France-Focquet, of Liége, Belgium, that depends on the separation of coal and refuse in the first period of settling, in which the particles are accelerating and during which the classification is according to specific gravity and not affected, at least in so great a degree, by the size of the particle as it would be in the latter part of the settling process, when the speed of the particle has reached its maximum and is no longer accelerated. Owing to the separation being effected in the manner indicated, close screening, such is customary in ordinary washers, is not necessary.

The raw coal is run by means of a current of water through an inclined trough, in which it is submitted to two forces: (1) An impelling force due to the motion of the water and (2) a retarding force due to friction of the particles. If 0.4 and 0.6 are taken as the coefficients of friction of coal and slate respectively, and the specific gravity of coal and slate are taken as 1.3 and 2.4, it can be proved by mathematical calculation that when coal is washed by horizontal currents of water no useful purpose is served by screening with openings the diameter of which bear a relation to each other less than 6 to 1.

When, however, coal is washed by upward-moving currents the screening should be in ratios of 2 to 1. Thus in treating raw coal from $\frac{1}{16}$ in. to $4\frac{1}{2}$ in. by the Rheolaveur, it is necessary theoretically to size the coal only into grades running between $\frac{1}{16}$ in. and $\frac{6}{16}$ or $\frac{3}{8}$ in., between $\frac{3}{8}$ and 18/8 or $2\frac{1}{4}$ in. and between $2\frac{1}{4}$ in. and the larger size, namely $4\frac{1}{2}$ in. With a washer using only upward currents coal should be divided into sizes running between $\frac{1}{16}$ in. and $\frac{1}{8}$ in., $\frac{1}{8}$ in. and $\frac{1}{4}$ in., $\frac{1}{4}$ in. and $\frac{1}{2}$ in., $\frac{1}{2}$ in. and 1 in., 1 in. and 2 in., 2 in. and 4 in., or with less exactitude $4\frac{1}{2}$ in. This makes it necessary to separate the coal into at least six sizes with upward currents of water and into not more than three sizes with the washer being described, and even such a degree of sizing can be still further diminished with the modifications to be described later.

Coal has been washed for many years in inclined troughs, the Elliot and Blackett washers being especially well known. The first is composed of a trough about 70 ft. long inclined on a slope of about 1 in. to the foot. Down this trough runs an endless chain fitted with scrapers. Raw coal is fed about half-way down the trough, the water being run in at the upper end. The clean coal carried along by the water passes over

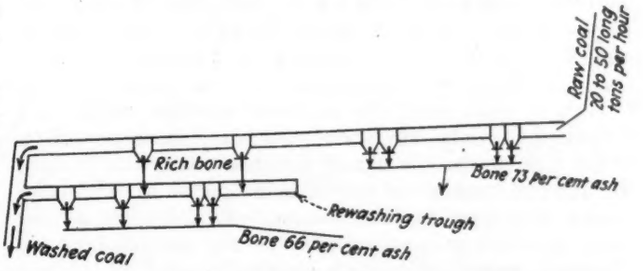


FIG. 2—CASCADE BATTERY REWASHES COAL

Little irregularities in washing may make commercial coal pass through the slot with some of the inferior coal. That being so, only coal of superior excellence is allowed to pass direct to the clean-coal pipe. The rest is allowed to fall with the bone coal into another trough, where it is washed again. There the absence of slate and superior coal makes it easier to classify the clean coal and bone coal into their proper classes.

*Translation by Amand Andry, Secrétaire de la Maison France-Focquet, 17 Quai Saint-Léonard, Liége, Belgium.

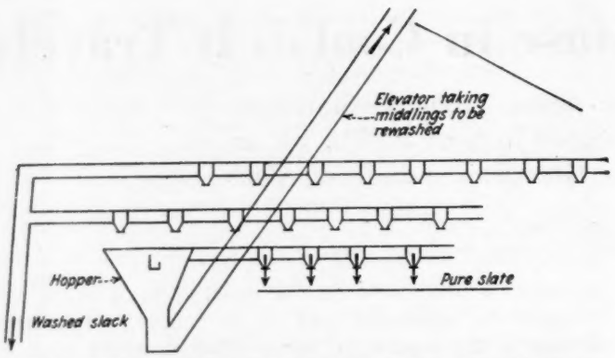


FIG. 3—ILLUSTRATES THE CLOSED CYCLE IN WASHING
The bone coal, discharged at the end of the third trough, is given yet another trial. It is delivered with the feed to the head of the first trough and plays a valuable part in the primary classification by putting a barrier between the slate and the clean coal.

the scraper, which moves in the opposite direction to the water screen. Thus the slate is scraped to the upper end of the trough.

On the other hand the Blackett washer consists of an inclined cylinder the internal surface of which is fitted with a spiral. The cylinder is rotated and fed with coal and water at the upper end by means of a trough which extends an adjustable distance into the cylinder.

The water carries the clean coal to the lower end, and the slate and other impurities are conveyed backward along the spiral and discharged at the upper end of the cylinder. Such washers do not by any means produce a perfect separation; the motion of the scraper and of the spiral so disturbs the water in the washer that classification is hampered.

The Rhéolaveur consists of a trough of sheet metal, cast iron or reinforced concrete, as desired, inclined at the upper end of a gradient of 1 in 10 or even of 1 in 5, the slope being diminished gradually till it is only 1 in 20 at its lower end. In the bottom of this trough are cut at intervals orifices beneath which are placed special boxes divided into two compartments and having adjustable orifices for the extraction of slate. Into the troughs, water is fed under a head of 20 ft. or less. The coal, whether round or cubical, is transported freely by the water along the trough, but the slate, being relatively flat, moves at much lower speed and lags behind the coal. In consequence the feed sinks in the water and is classified according to specific gravity. As it is carried along the classification continues.

The particles of slate are deposited first and form a natural slope inclined in the direction of the stream. When this slope has reached a certain sufficient inclination the particles of slate are carried along by the force of the water, but quite slowly because of their shape and of their friction on the deposited material.

If a simple slot were made in the bottom of the trough at that point the particles of slate would fall through it, as also the water and coal; consequently in order to keep the water and the coal within the trough, an upward current of water is produced by a special device known as the Rhéolaveur box, which allows the slate to fall but does not disturb the classification or allow the water or coal to leave the trough. If the bed of slate is sufficiently thick and the slot correctly placed, only a slow upward current will be required to sustain the coal and bone. In these boxes is also a downward current which facilitates the discharge of the slate from the box. The pressure of the water is regulated by a valve and the extraction of the slate by conical apertures.

The upward current also has the effect of pushing the lighter particles above those that are more dense, thus preparing the slice of slate for extraction at the slot following.

The classification progresses as the feed continues along the trough until the last slot is reached. Here the bone coal, or middlings, is discharged. The whole process is so regulated that at the end of the trough nothing is left but commercially pure coal, and for this purpose the last boxes are arranged so as to extract a product containing some commercially pure coal which is to be re-treated, as will be explained later. Thus all the dense particles must reach the bottom of the trough before they arrive at the last box. This is why the slope of the trough is diminished toward the end and why no upward current is provided in the last slot.

Dams also are arranged in the bottom of the trough, the object of which is to retard the flow of water and increase the friction of the slate.

It has just been said that the product extracted by the last box is to be rewashed, and accordingly the washer is arranged as in Fig. 2, which shows what is known as a "cascade battery."

In instances where the washing of the product is unusually difficult, a considerable number of successive washings could be provided. To guard against this inconvenience, the scheme known as "rewashing in a closed cycle" has been devised. This rewashing consists of conveying back to the head of the plant the product carried to the end of the rewash trough by means of a suitable elevating conveyor (see Fig. 3). This product consists, of course, of particles of specific gravity greater than coal and less than slate. When introduced into the feed it forms a sort of artificial barrier be-

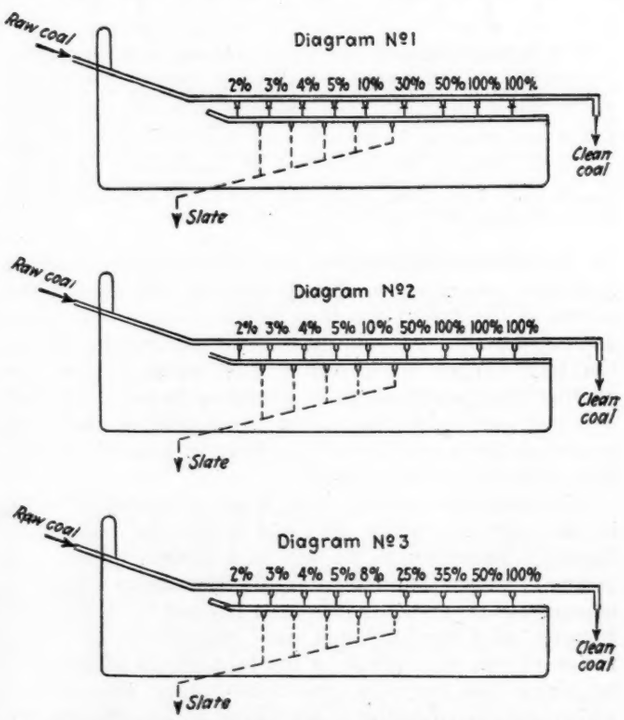


FIG. 4—FLOW SHEETS FOR THREE KINDS OF COAL
The coal of which Diagram 1 is the flow sheet is of normal character. The sheet marked Diagram 2 is for cleaner coal and diagram 3 is for a dirtier coal than the other two. Only one box in the last case discharges clean coal, only two in the first case and three in the case of the cleanest coal of all.

tween the pure coal, which is light, and the pure slate, which is dense. Moreover, whenever the composition of the feed varies, the thickness of the slice of intermediate products, or bone, also varies accordingly, and it is easy to realize that this forms a layer preventing the purer coal from being mixed with the slaty material.

To explain this arrangement more clearly, Diagrams 1, 2 and 3 in Fig. 4 are given to outline the principal conditions which occur in washery practice. These diagrams show also the various percentages by weight of commercially pure coal discharged by the different boxes, depending on the proportion of shale contained in the raw material.

In Diagram 1 the first group of boxes work with a weak upward current of water, and shale with 2 to 5 per cent of commercially pure coal falls through them to the rewashing trough. Those of the second group operate without the addition of any water and the commercially pure coal contained in the shale increases progressively from 10 per cent till the last two boxes pass what is practically commercially pure coal.

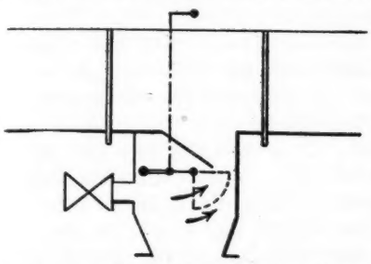


FIG. 5—SEALED CHAMBER FOR LARGE COAL

Large coal requires so big a slot that the trough would empty if no provisions were made to prevent it. So a flap is arranged which opens and closes and so sustaining the level of the material in the trough.

In this manner the coal delivered at the end of the trough is of the purity needed for marketing purposes. All the apertures in the second trough are supplied with upward currents of water so as to prevent any of the commercial product from being extracted with the slate. Of course, some of the product passing over the end of the second trough contains some bone, but this is of no importance because this product is to be washed the third time.

Diagram 2 shows the method adopted where the feed is cleaner than in Diagram 1. In this case there are three boxes in the upper trough which discharge pure coal. Where, as in Diagram 3, the feed is dirtier than in Diagram 1, only one box in the upper trough discharges pure coal.

It is easy to realize that in all three cases the bone is rewashed in the upper trough and consequently can be entirely extracted as the rewashing permits the retreating of any products leaving the lower trough. The above considerations apply to the washing of fine coal from 0.01 in. to 0.3 or 0.4 in. in diameter.

In washing coal from 0.3 or 0.4 in. in diameter the principle is similar to the washing of fines. The regulation of the upward current, however, would require too much care, as the slots would necessarily be rather wide to pass the largest particles.

The trough for treating large coal is shorter than is used for fines, because the former is more rapidly sorted than the latter. The whole plant usually consists of one trough fitted with two chambers, the first of which extracts slate and the second discharges a mixture consisting of the bone and some coal. This mixture is elevated to the head of the trough and forms a sort of barrier between the clean coal and the slate, just as has been said occurs in the washing of fines. Where many flat particles of slate are found in the feed it is easy to extract them by the second chamber with a reduced upward current or with none whatever.

With a device of this character it is possible to wash coal from zero to 2½ in. without any preliminary screening. Fig. 8 shows such a washer. The first trough has two sealed chambers, the first of which extracts pure slate and the second a mixture to be rewashed, as already explained. The trough discharges the clean coal, which passes on to a screen which extracts particles from zero to 0.2 in. in diameter. These are rewashed in one or two troughs fitted with free-discharge boxes. The fines are drained by a special drainage scraper which compresses them and thus extracts some of the water.

That is why, in this case, use has been made of an apparatus known as *"à niveau plein,"** or sealed type of box directly connected to the boot of a sealed bucket elevator. These boxes are fitted with an oscillating flap, and owing to these provisions the slate is extracted without any loss of water whatever. The flap oscillates between a horizontal position which nearly closes the slot and a more or less inclined position, according to the aperture which the size of the largest particles may require.

In order to prevent such a complete extraction of the slate as would make a break in the bed of slate and let the pure coal pass down, the slot has been replaced by a chamber which works almost like a classifying agent. When the flap opens, a stream of water strikes the slate. The slate drops through the flap but any particle of coal that may be associated with it is driven upward and prevented from falling through the trap. Thus is avoided the suction which has had so undesirable an effect in the operation of a jig. When the flap closes much the same result is attained as by a stroke of a jig (see Fig. 5).

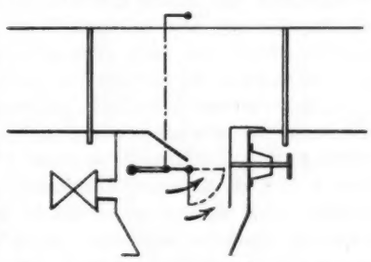


FIG. 6—SEALED CHAMBER WITH VARIABLE OPENING

In this case a wheel is added, the movement of which enlarges or diminishes the aperture.

The chambers also have been fitted with a moving vertical flap which makes it possible to regulate the aperture through which the slate is discharged from the chamber (see Fig. 6). With these appliances coal from ¼ in. to 4 in. can be treated.

When the raw coal to be treated is dry, it is often advisable to extract dust from zero to 0.02 in. before washing. This is done by means of a pneumatic dust extractor or by vibrating tables. This extremely fine dust can be mixed wholly or in part with the washed fines. In this way it is possible to prevent the formation of coal slimes.

When the raw coal is wet, it is better to wash it all, regardless of its fineness. If, after washing, the particles between zero and 0.02 in. are clean, it is well to provide means of settling this fine material, large hoppers being provided for that purpose. If, however, the fine particles are somewhat dirty, it is desirable to eliminate them from the washed fines and consequently smaller hoppers will suffice, so that these extremely fine particles will be discharged wholly or partly with the waste water.

*Having the opening filled level [with deposited material].

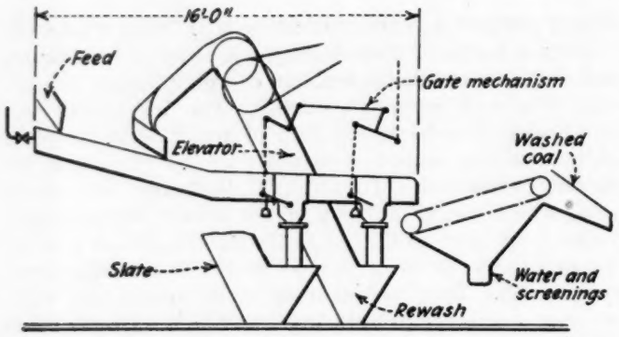


FIG. 7—ARRANGEMENT FOR WASHING COARSE COAL
Here are only two traps, one for slate and one for bone coal. Only one trough is provided, and the bone from the second trap is rewashed with the feed.

Sometimes it is better to settle all the fines in hoppers and before storing them in bins to rinse them with the clear water from the elevator by which the washed fines are conveyed. Provision is easily made for this by fitting the chute with a fine screen on which clear water is sprayed. The slime thus withdrawn is collected in V-shaped hoppers.

Three Principles Used in Washer Design

This type of washer therefore is based on the following principles: (1) The raw coal is submitted to the action of a horizontal current of water in a rectilinear trough of which the length, shape and slope are designed so as to provide as perfect a separation as possible. In this the coal progressively receives its primary classification. (2) The heavy particles systematically and progressively deposited on the bottom of the trough are extracted by an extremely simple device which not only removes the slaty material but at the same time assists the primary classification by utilizing upward currents of water, the velocity and direction of which are arranged so as adequately to effect the desired result at each phase of the classification. (3) By treating the heavy discharge of the first trough in a second immediately beneath it, the loss of valuable coal is avoided. Sometimes a third trough is used to rewash the heavy material evacuated by the second.

If there is a change in the quality or quantity of the material to be washed, the rewashing of the bone coal in a closed circuit introduces an averaging of these variables. Thus the cascade battery smooths out irregularities in feed just as the flywheel compensates for the inequalities in power output and outgo.

The bone when being rewashed acts as classifying agent, making an artificial barrier between the coal and the slate which prevents any of the coal from mixing with the slate and being drawn out into the refuse. By the closed circuit the quantity of bone in the raw feed is supplemented by bone from previous washings and in a short time becomes sufficiently deep to make a layer of bone through which the coal cannot pass at any of the boxes by which slate destined for the rockpile is drawn.

The advantages of this type of washer are a reduction of the percentage of carbon lost in the slate, a reduction in the quantity of slimes to be handled, less capital investment, less power consumption (for a jig will require 2 hp. per ton-hour capacity and a Rhéolaveur only 1 hp.), greater efficiency, a saving in water circulation and consumption, less attendance and labor and lowered upkeep cost.

In conclusion the method of determining the character of coal to be rewashed may be reviewed. A series of liquids are prepared of different specific gravities, as, for example, 1.2, 1.3, 1.4, 1.5, 1.6 and 1.7. A sample of dried coal is weighed. It is then put into the liquid of a specific gravity of 1.7. What sinks is dried, weighed and burned to ash. What floats is put into the next liquid in the series, which has a specific gravity of 1.6. What sinks is dealt with as before. The float is successively put into the whole series of liquids and from the liquid at a specific gravity of 1.3 both sink and float are dried, weighed and burned to ash.

With the figures thus obtained a diagram can be drawn showing the washability of the coal and the results to be sought. In practice the Rhéolaveur washer will come close to the figures thus obtained.

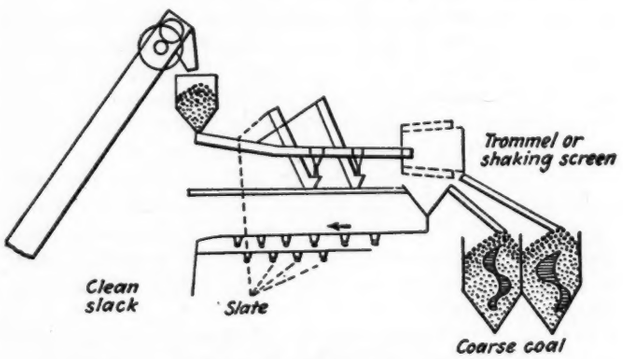


FIG. 8—PLANT TO CLEAN COAL UP TO 2½ IN.
The coal, cleaned over two traps, one for slate and one for bone, passes to a trammel. The coarse coal goes to storage bins, and the fine coal is rewashed by a cascade battery like that shown in Fig. 2.

Bituminous Coal Loaded Into Vessels at Lake Erie Ports During Season to End of October

Ports	Railroads	1923 Cargo	1923 Fuel	1923 Total	1922 Cargo	1922 Fuel	1922 Total	1921 Cargo	1921 Fuel	1921 Total
Toledo	Hocking Valley	4,275,580	128,024	4,403,604	2,820,504	81,750	2,902,254	4,079,150	107,350	4,186,500
	N. Y. C.-Ohio Central Lines	1,123,196	34,856	1,158,052	631,551	18,225	649,776	1,027,438	29,667	1,057,105
	Baltimore & Ohio	2,491,822	73,702	2,565,524	2,483,345	64,600	2,547,945	2,354,369	72,016	2,426,385
Sandusky	Pennsylvania	2,733,993	87,399	2,821,392	2,165,807	80,493	2,246,300	1,552,971	45,076	1,598,047
Huron	Wheeling & Lake Erie	1,316,228	51,762	1,367,990	299,292	12,684	311,976	1,491,595	42,905	1,534,500
Lorain	Baltimore & Ohio	3,113,444	170,299	3,283,743	1,214,512	68,567	1,283,079	2,393,742	97,034	2,490,776
Cleveland	Pennsylvania	1,625,999	179,898	1,805,897	784,011	77,677	861,688	1,990,664	86,325	2,076,989
	Erie	691,679	30,286	721,965	238,475	9,127	247,602	359,981	12,782	372,763
Fairport	Baltimore & Ohio	741,256	69,056	810,312						
Ashtabula	New York Central	2,964,539	233,635	3,198,174	1,073,415	68,697	1,142,112	1,064,824	59,124	1,123,948
	Pennsylvania	1,859,006	81,373	1,940,379	1,134,222	71,730	1,205,952	2,213,665	72,753	2,286,418
Conneaut	Bessemer & Lake Erie	2,446,562	214,030	2,660,592	1,153,334	46,733	1,200,067	1,362,601	18,258	1,380,859
Erie	Pennsylvania	596,461	78,816	675,277	159,461	60,739	220,200	979,869	61,103	1,040,972
Totals		25,979,765	1,433,136	27,412,901	14,157,929	661,929	14,818,951	20,870,869	704,393	21,575,262

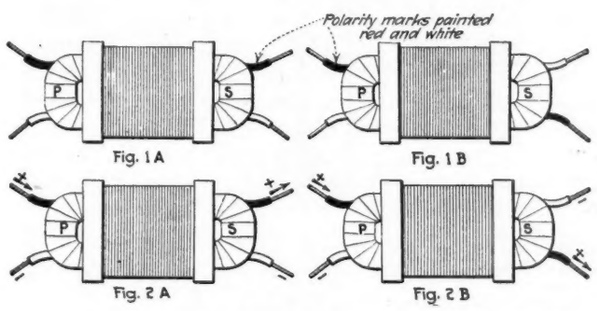
Compiled by Ore & Coal Exchange, Cleveland, Ohio: H. M. Griggs, manager.

Connections Between Meters And Transformers*

Instantaneous Polarities of Terminals—Properly Connecting Meters—Tracing Instrument Cable Wires—Following Circuit in Complicated Diagrams

MUCH confusion often results when endeavoring to properly connect meters and instruments to electric power circuits; especially is this true on switchboards using the same instrument transformers for meters and relays. There are several methods of checking these connections but many of them are so elaborate that they are impractical for everyday use. When wiring up wattmeters and watt-hour meters it is necessary that the current and potential coils be connected so that the flow of current at every instant is such as to produce proper direction of rotation or deflection of the meter.

With simple single-phase circuits not using instrument transformers it usually is rather easy to make the proper connections, but when transformers are used on polyphase systems where the meters are wired to the instrument transformers through wires passing through conduits the problem is sometimes quite difficult.



FIGS. 1 AND 2—POLARITY MARKING ON INSTRUMENT TRANSFORMERS

In painting the framework and equipment behind a switchboard it is important to preserve these polarity marks on the instrument transformers; otherwise considerable confusion may result when making changes to the wiring.

One of the simplest methods of checking meter and transformer connections is by following the direction of the currents at a given instant. In order to do this it is necessary to know the instantaneous polarity of transformers, circuits and instruments.

Instantaneous Polarity Marks

With direct current it is assumed that the current flows from + to —; so if the polarity of a piece of apparatus is given the direction of current flow can be determined, and conversely, if the direction of current flow is given the polarity can readily be determined. The same rule holds true in alternating current, although both the polarity and direction of current flow reverse perhaps 50 to 120 times per second, depending on the frequency of the circuit. Therefore, in order to find out the relation of polarity and current flow in alternating-current diagrams, we pick out any particular instant and label the polarity at that instant, the "instantaneous polarity" with a + or —, and label the current at that instant, the "instantaneous direction of current flow," using a small arrow to denote the direction. In the accompanying diagrams all the + signs may be changed to — and all the arrows reversed, yet the results will be absolutely the same.

Consider for the first case, an ordinary potential transformer. These devices usually have two primary and two secondary leads, and one of each will be painted red or white. The diagrams will appear somewhat like Figs. 1*A* or *B*. Since the primary *P* consumes power, if it is assumed that the polarity mark is +, then the direction of current at that instant will be as shown by the small arrows in Figs. 2*A* and *B*. The secondary *S* is acting like a generator of power, so with this polarity mark + the direction at that instant will be as shown by the little arrows on the secondary side. The same method may be expanded to a complete diagram and take the form of Fig. 3, which shows a potential transformer connected to a voltmeter.

Marks on Wound Primary Transformers

When the current transformers contain a wound primary, thus having a total of four leads, the polarities are just the same as for a potential transformer. Many current transformers, however, have a hole through which a line wire may be passed to form the primary. These transformers will have a white or red spot painted on one side of the transformer at the end of the hole, thus denoting that at the instant when the current flows through the line wire from the polarity marked side to the opposite side, then the secondary current will leave the polarity marked lead and flow to the opposite lead. Fig. 4 shows the relation between polarity marks and current flow in this type of transformer.

Examining the instructions furnished by the manufacturer, a wattmeter diagram may be found similar to Fig. 5, and in order to most easily and correctly connect this in the circuit, it should be marked with the instantaneous polarities and direction of current flow. Assuming that the right-hand wire is + at a particular instant, then the small arrows in Fig. 6 will indicate the direction of current flow at that instant in both current and potential windings. Note that this manufacturer places polarity marks on the opposite ends of the transformers. If these polarity marks do not occur in the diagrams furnished, it may be assumed that these marks are both on the same end. Thus if Fig. 5 did not designate polarity marks, the instantaneous directions of current flow would be those of Fig. 7 rather than Fig. 6.

Making Two-Phase Connections

Two-phase circuits may be treated exactly like two single-phase circuits, whether they employ four wires or three. If the two phases employ a common wire, then it may have two sets of arrows to show the current flow. These need not interfere even if pointing in opposite directions, as that condition simply means that the wire is carrying only the difference of two currents and does not interfere with the polarity or instantaneous markings in the least.

Three-phase circuits are also marked by assuming the polarities at any instant. There may be twelve distinct sets of instantaneous directions of current flow in a three-phase circuit, any one of which will work correctly, but for the sake of uniformity the instant usually assumed is when the current is flowing toward the load in the two outside wires and returning in the middle wire or neutral.

*Abstract of article by Victor H. Todd, engineer, Westinghouse Electric & Manufacturing Co., in *Power*, Sept. 11.

Consider first the manufacturer's diagram, Fig. 8, which is for a polyphase wattmeter. It is assumed that the outside wires are + and the middle wire —. through the current coil of the wattmeter, which must correspond to the same phase as the potential coil, then over through the oil-switch trip coil, through the common wire and the ammeter back to *F*. In a similar manner, starting at *E*, the circuit is through the other current coil of the wattmeter, the other trip coil, ammeter and back to *F*. It will be noted that there is a common connection between the common connections of both the current and potential transformers, but this is for protective purposes and is usually grounded and does not carry any current in normal operation.

Many times wiring must be run in conduit, as the transformers may

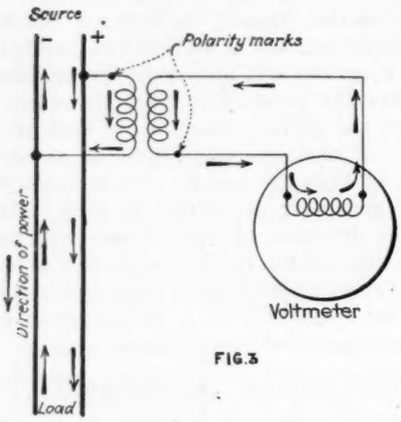


FIG.3

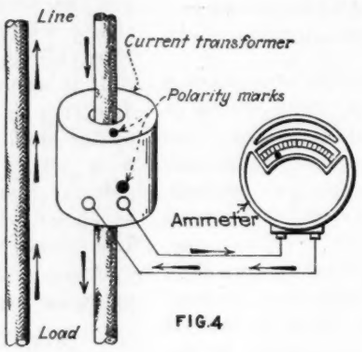


FIG.4

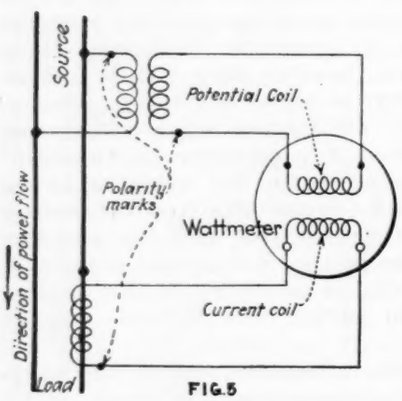


FIG.5

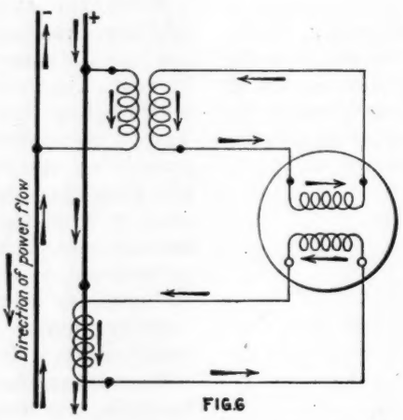


FIG.6

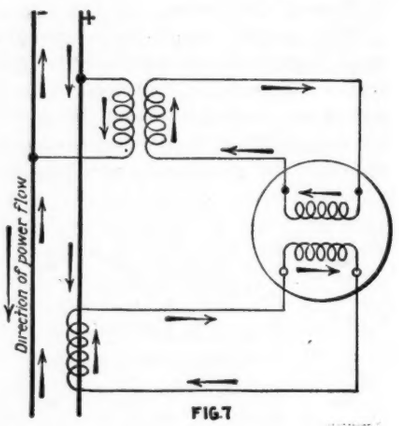


FIG.7

FIGS. 3 TO 7—SHOW RELATION BETWEEN POLARITY MARKING AND METER CONNECTIONS

Fig. 3—Instantaneous direction of current flow in a potential transformer. Fig. 4—Instantaneous direction of current flow in a current transformer. Fig. 5—Diagram for single-phase wattmeter and transformer connection with polarity marks indicated. Fig. 6—Same as Fig. 5, with instantaneous direction of current flow indicated. Fig. 7—Instantaneous direction of current flow when polarity marks are not given

Then the instantaneous directions of current flow are as indicated in Fig. 9.

For the foregoing simple cases, perhaps other systems of connection identification could be devised to work as well, and in fact the experienced instrument man would often not even require a diagram to hook up a meter correctly. But the greatest application of this system lies in laying out wiring diagrams for switchboards where perhaps ammeters, relays, power-factor meters and other devices may be all connected to the same transformers. Then the checker will set before this complete switchboard wiring diagram and, starting at the polarity mark on a transformer, follow the line through its maze of wiring, putting a little arrow at short intervals as he proceeds, until finally the line thus diligently followed ends at the opposite side of the transformer.

Combining Instruments and Relays

As an example of this consider Fig. 10, which is a diagram of an alternating-current panel with a wattmeter, ammeter and oil switch. For the potential circuit, first start at *A* and the line goes through the fuse, potential coil of wattmeter, fuse and back to *B*. Again starting at *C*, the path is through the fuse, other potential coils, fuse and back to *B*. Starting at *D*, of the current transformers, the path must ultimately come back to *F*. Therefore, from *D* the circuit is be located at considerable distance from the switchboard or instruments. In such cases it is preferable to run two wires from the current transformers and make the common connection at the meter rather than at the transformers. A wattmeter diagram like Fig. 9 would then take the form of Fig. 11, where the wires are shown entering the conduit at the transformers and leaving at the meter.

Care must be used in identifying the wires as they enter and leave the conduit. One way is to ground one wire to the conduit at one end, and then at the other end pick out with a magneto, bell and battery or megger, the wire that gives a circuit through the conduit. Mark both ends with paint or tags so they may be easily distinguished. Then ground the next wire and identify it at both ends, and so on. This process is rather a long drawn out one, and there is always the danger of getting the markings mixed, which everyone familiar with this class of work knows. Furthermore, if the devices are disconnected, then it is a case of seeing that the wires are properly marked so that they may be connected up again correctly, and this is always a source of trouble. To overcome this difficulty, it is becoming general practice to use different colored wires for connections between transformers and meters.

Perhaps the easiest and best way to identify meter and instrument wiring whether it be in conduit or not.

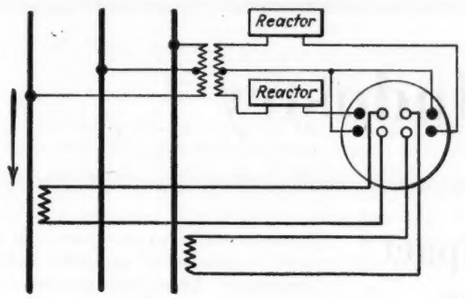


FIG. 8—MANUFACTURER'S DIAGRAM FOR POLYPHASE WATTMETER CONNECTIONS

For construction purposes polarity markings must be followed consistently.

is to use wire with various-colored insulations. Cables may be obtained with either 2, 3, 4 or 7 different colored wires under one covering. For polyphase wattmeter work it is best to employ a 4-wire cable for the current and a 3-wire cable for the voltage. Many firms use 7 conductors for this, but often the potential transformers are located at some distance from the current transformers, thus entailing considerable skinning of insulation and waste of cable.

Now if a polyphase watt-hour meter is to be connected to transformers with the wiring in conduit, the diagram would appear like Fig. 11, where the instantaneous polarities, directions of current flow and colors of the wires are clearly marked.

This marking has been standardized by a large central station, and when meter wiring is encountered, every meterman can tell at a glance just which wires are potential and which are current; which wires feed and which return; and in this way it is easy to connect the meter correctly, and if one were connected wrongly, it would soon be detected.

In Figs. 8 and 9 reactors are shown in series with the potential coils of the wattmeter. The only time resistors are used in series with the potential circuit of a wattmeter or watt-hour meter is when the potential

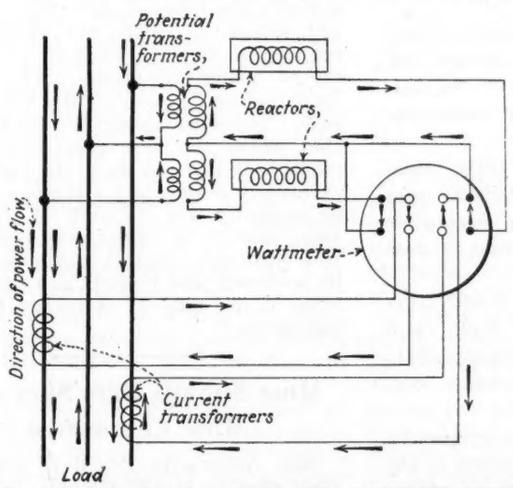


FIG. 9—SAME AS FIG. 8 BUT WITH INSTANTANEOUS DIRECTION OF CURRENT GIVEN

This is how the checker's diagram shows the instantaneous directions of the currents.

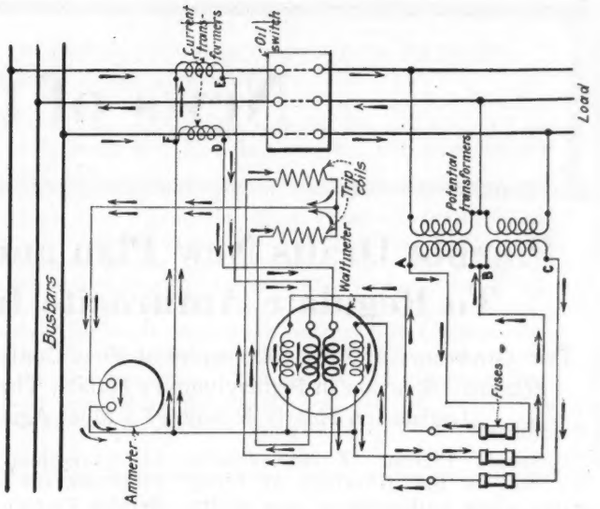


FIG. 10—INSTRUMENTS AND TRIP COILS CONNECTED TO SAME TRANSFORMERS

By starting at the transformer terminals each circuit may be followed and checked back on itself.

circuit of the meter is free from inductance, as in the dynamometer type. Meters of the induction type have high inductance in the potential circuit, consequently must have a reactor in series to cause the

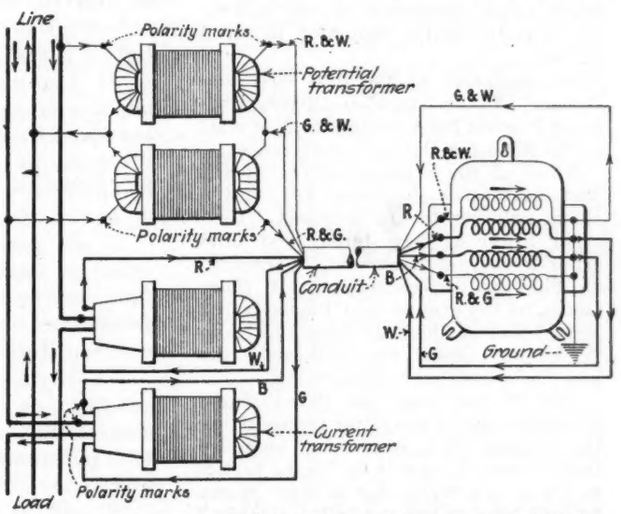


FIG. 11—SHOWS USE OF MULTI-COLORED CABLE FOR CONNECTING UP METERS

R. = red; W = white; B = black; G = green; R & W = red and white; R & G = red and green, and G & W = green and white.

current to lag sufficiently to give 90-deg. displacement between the current and potential fluxes. A resistor would tend to throw the potential current in phase, and the meter could not be calibrated on varying power factors. The meter and reactors are calibrated as a unit and must not be confused with multipliers. It is impractical to build a meter with a reactor multiplier, as such a reactor must have exactly the same characteristics as the potential circuit of the meter, and this is done only in rare cases.

Practical Pointers for Electrical and Mechanical Men will be found on pages 859 *and* 860; *Problems in Underground Management on pages* 861 *and* 862

News of the Industry

Pinchot Drafts New Plan and Compact To Regulate Anthracite Industry

Two Governors and Nine Delegates at First Conference Lukewarm to Scheme—Solution in Pennsylvania's Hands, They Say—Proposed Legislation Nearly Ready—To Meet Again Dec. 13

Governor Pinchot of Pennsylvania has sent to the governors of thirty states using anthracite a copy of the proposed compact of the states, suggested at the conference of the representatives of twelve states at Harrisburg, Nov. 26, together with the complete proceedings of that meeting. Within a few days he will forward to the same governors a copy of his proposed federal legislation, which, with the co-operation between states, provided for in the compact, he says, will bring about regulation of the anthracite industry and a reduction in retail prices.

As suggested at the first coal conference of the state executive, Governor Pinchot fixed Dec. 13, at 2.30 p.m., as the time for the next conference.

None of the representatives at the first conference displayed any enthusiasm relative to the compact. Governor Silzer of New Jersey and Governor Preus, of Minnesota, opposed it, as did the representatives of other states, on the ground that Pennsylvania should declare the coal industry a public utility, repeal the anthracite tax and the miners' certification law.

The Pinchot plan, the Pennsylvania Governor said in his letter transmitting the compact draft, is new and he added that it seems to him to be "sound tactics to try a new way," for at least it can be said "that it has not failed already." The plan is legally good, he said, and in his suggested plan he cited numerous instances of compacts between states and many court decisions to prove their validity. As a part of uniform control the compact will "have more effect than such legislation has ever had before," he wrote.

The points stressed by the Governor in his letter were that under the compact the coal business would be declared a public utility and this would be the basis from which two co-operating commissions would work to regulate the industry and finally to fix prices, among other things. There would be a joint commission of five members, if the United States does not ratify the compact, and of seven, if it does.

The compact also provides for a Pennsylvania Coal Commission which would consist of the Pennsylvania member on the joint commission—the compact providing that the anthracite state be represented — who would act as chairman, the chairman of the Public Service Commission and the Attorney General of Pennsylvania.

The Pennsylvania commission would regulate the anthracite industry within Pennsylvania in co-operation with the joint commission and the federal government. The joint commission would have power to fix prices after investigation and publication of facts. Its price-fixing power would commence after the sale of coal at the mines or after the coal leaves the mines. It would be expected to provide efficient service to the consumers, to prohibit discrimination, to provide equal distribution and would have power to pool profits and coal delivered. It would fix standards of size and quality, license dealers and otherwise regulate the trade.

In his draft of the compact Governor Pinchot outlines the proposed compact as follows:

In addition to Governors Pinchot, Silzer and Preus the others at the conference of Nov. 26 and the states they represented were: Major H. P. Sheldon, Vermont; Cyrus Locher, Ohio; James A. Hamilton, Connecticut; E. C. Hultman, Massachusetts; J. J. Rutledge, Maryland; George H. Webb, Rhode Island; J. R. A. Hobson, Virginia; W. E. Snide, Michigan, and Dr. F. J. Monaghan, New York.

Governor Pinchot Outlines His Proposed Compact as Follows:

"The proposed compact will be an exercise of the constitutional powers of the states and of the United States.

"It conforms to established practice illustrated by a host of examples from 1784 to 1923.

"It will be identical legislation by the contracting states, which no one of them can repeal.

"It will insure unity of administration under this legislation, thus pooling the legislative and administrative power of the contracting states.

"If Congress so chooses, it will add to the pool the legislative and administrative power of the federal government over interstate commerce.

"If not, it will at least make co-operation by the federal government possible by giving it only one state authority to deal with.

"It will remove a doubt whether production by itself is a public utility which Pennsylvania alone can constitutionally regulate.

"It will insure investigation and publicity by an agency of the consumers as to all these stages of the business and as to mining in addition.

"It will insure the benefits of regulation to consumers by applying the regulation to every stage of the business from the mine to the consumer."

Treadway Advises Repeal of Anthracite Tax

In a statement issued Nov. 28. Representative Treadway, of Massachusetts, called on Governor Pinchot to summon the General Assembly in special session to repeal the "$8,000,000 tax levied against citizens of other states" using anthracite. "If a sufficient number of people," Mr. Treadway said, "continue telling Governor Pinchot where the first great fault lies, namely, at his own door, the fact may eventually permeate his brain. Unless he promptly sees the drift of the current, instead of impotently trying to row upstream against public opinion, he soon will find himself and his state laws in the eddy of stringent federal legislation."

Must Submit Rate Sheets to Mine Committee

The Anthracite Board of Conciliation, meeting in Philadelphia, Nov. 30 decided that all operators of the hard-coal fields must submit copies of their rate sheets to the mine committee at each colliery. This was provided for under the last agreement but in some cases owners of collieries have declined to permit sheets to be removed from the colliery office, asking that the mine committees go over the details at the office.

SUMMARY OF RATES PAID TO COMPANY MEN IN ANTHRACITE MINES UNDER DATE OF APRIL 1, 1923, AS REPORTED BY U. S. COAL COMMISSION

Summarizing the outstanding features in the analysis of rates paid 53,159 company men under date of April 1, 1923, it is found that the significant range in rates varies from 27 to 71c. an hour. The bulk of the wage earners, approximately 88 per cent, received between 51 and 71c. an hour. Of the 10 per cent who received less than 51c., a little over three-fourths were boys.

Of the adult workers receiving 27 to 71c. per hour, 95 per cent received between 51 and 71c. A further refinement of the rates paid this 95 per cent shows that 19.1 per cent received between 51 and 53c. an hour, 5.5 per cent between 53c. and 55c.; 8.9 per cent between 55c. and 57c.; 5.9 per cent between 57 and 59c.; 15.6 per cent between 59c. and 61c.; 18.2 per cent between 61c. and 63c.; 6.1 per cent between 65c. and 67c.; 9.7 per cent between 67c. and 69c. and 0.3 per cent between 69 and 71c.

A comparison of rates in the three coal-producing regions shows that the inside workers in Schuylkill region received somewhat higher rates than similar employees in the Lehigh region. On the whole the inside employees in the Wyoming region received the lowest rates. In the case of the outside workers the highest rates are paid to the employees in the Wyoming region, the next highest in the Schuylkill and the lowest in the Lehigh region. There existed a differential between the rates paid inside and outside men which amounts to 8.1c. per hour in favor of the inside day men.

Pay of Anthracite Company Men Ranges From 27c. to 71c. an Hour

Report of Coal Commission on Hard-Coal Wages Shows Significant Variation in Earnings—Inside Workers in Schuylkill Region Better Paid Than in Other Two Fields

Wage rates in the anthracite industry are the subject of a report by W. E. Fisher, released by the U. S. Coal Commission last week. The report was prepared early in the summer and made available to the anthracite operators and miners during their wage negotiations. It was available also to Governor Pinchot at the time he granted the miners a 10-per cent wage increase.

Mr. Fisher's summary of his findings on hourly rates paid the company men, which constitute 60 per cent of the hard-coal workers, is given in full in the box at the top of this page. It is pointed out that the men employed as blacksmiths, carpenters, firemen, machinists and electricians at the anthracite mines work practically a full time year, and hence no attempt was made to compare their rates of pay with those of similar occupations in the building trades.

It is noted that the hourly rates in the Schuylkill region are higher than in the other two regions, and that irrespective of occupation or of region there is a differential of 10c. an hour in favor of the inside day men over the outside men. Mr. Fisher says, however, that "a weighted average lowers this differential to 8.1c. an hour in favor of the inside men."

"A presentation of the rates paid to tonnage men has been considered practically impossible," says the report. "As already explained, the contract miners and their laborers are piece workers. The units of work for which payment is made vary not only in the different coal fields but also from colliery to colliery, and even within different sections of the same colliery." The different methods of mining have necessitated different methods of wage payments.

The report studies the trend of wage rates in the anthracite industry from 1901 to 1923 and summarizes the detailed studies by showing that the relative wage rates of anthracite contract miners have increased from 100 in 1902 to 213.6 in 1923, prior to Sept. 1.

The lack of uniformity and the wide variation of rates is shown in an elaborate series of statistical tables accompanying the report.

It was on the basis of this study by Mr. Fisher that the Coal Commission, in a report to the President on Aug. 23, 1923, following its unsuccessful effort to bring the miners and operators together for a new contract, said:

"The Commission reiterates its finding that there are inequalities and injustices in the present wage scale, not only in the entire anthracite district but even in individual localities and mines. It quotes for your information the following facts as found by its investigators, in proof of this statement:

"'In one district, company miners are now paid fifteen rates in twenty-two mines and in another district thirty-eight different rates in sixty-five mines, the hourly wage ranging from 59.4c. to $1.02. Similarly in the same districts, an outside occupation, like carpenter, may have thirty-seven different rates in twenty-two collieries, with a range of from 52.5c. to 72.7c. an hour, while in the other districts the maximum rate for the same job is 90c. and $1. Similar variations in wage rates for the same job are found throughout the anthracite region, the same mine paying five, six, or even seven different rates for outside laborers.

"'Even with the piece workers or tonnage men, the contract miners and their laborers, the rates paid in different mines cannot be directly compared. In one mine there is separate payment for each item of additional work, such as setting props and laying sheet iron, while in another mine in the same district, payment for these items is included in the car or ton rate for coal mined and loaded. These differences in tonnage rates may also involve marked inequalities inherited from the more or less haphazard arrangements of rates which prevailed twenty years and more ago. And the marked differences in annual earnings of these miners are in part traceable to differences in rates. In the same mine, miners working the full year range in earnings from $1,698.14 for 282 days to $6,414.64 for the same number of days. In another mine, a miner earned $4,471.88 in 283 days, while another working 5 days more, earned $1,897.50. Or stating it in another way, the same earnings for different miners in another mine may represent as much as 53 days' difference in working time. Obviously, any flat percentage increase in rates would only further widen the spread in earnings of men rendering similar service.'

"Other instances might be supplied, but it is not necessary for the purposes of this report. They will be found in the special report on Wage Rates in the Anthracite Industry.

"The origin of these inequalities is found in the 1902 rate structure, which was without any scientific basis, since at that time wages and rates varied from mine to mine and even from working place to working place within the same mine. These different bases of pay and innumerable rate differentials then in force were crystallized in the 1903 award; and successive percentage increases have served simply to accentuate and increase the inequalities. The inequitable conditions surrounding this complex wage-structure are manifestly unfair to the individual mine workers, and the recognition of this led the Commission to make its recommendation above quoted."

Effective Dec. 1, D. E. Gelatt was appointed general coal freight agent of the New York Central R.R. with headquarters at 466 Lexington Avenue, New York City. The position of coal traffic manager was abolished.

Trade Commission Takes Up Madeira-Hill Case

Dec. 3, the first day of the hearing before the Federal Trade Commission in the Madeira-Hill case, was taken up largely with a review of the coal situation leading up to the specific events to be considered later. F. R. Wadleigh, formerly Federal Fuel Distributor, testified as to the location of the various coal fields and of the negotiations in connection with the voluntary establishment of fair prices.

E. S. Felton, former chairman of the Pennsylvania Fair Practices Committee, testified that prices suggested by that committee during the anthracite strike as reasonable for different sizes of coal were arbitrarily set, but neither Madeira, Hill & Co. nor any other producers were compelled to abide by the prices fixed by the Federal Trade Commission.

The anthracite situation is a matter of chronic worry in New England, the commission was told by Eugene C. Hultman, Fuel Administrator of Massachusetts. There is a permanent shortage of hard coal, he declared.

Electrical Engineers Meet In Anthracite Field

The Lehigh Valley Section of the American Institute of Electrical Engineers held its last meeting at Pottsville, Pa., Nov. 16 and 17. Considerable more interest has been given to meetings held in this region due to the importance attached to the electrification of mining equipment.

On Friday evening a dinner and business session was held at the Schuylkill Country Club. C. A. Grenidge, chief engineer of the J. G. White Company, explained many details with reference to the new Pine Grove power plant. Another speaker was William H. Lesser, electrical engineer of Madeira, Hill & Co., who spoke on the subject of electrification of the coal mines and gave records showing the progress of the work and the benefits derived in lower costs, higher efficiency and flexibility resulting therefrom.

Urge Dake for Coal Chief of Commerce Department

No selection for the position of chief of the Coal Commodity Division of the Department of Commerce has been announced at the time of this writing. It is understood that the names of J. D. A. Morrow, C. P. White, C. P. Starr and W. M. Dake, Jr., were suggested in this connection, but it has been ascertained that neither Mr. Morrow, Major Starr nor Mr. White is in a position to accept the place. Their other activities are such as to preclude their acceptance of the position even were they willing to make the financial sacrifice which would have to be incurred were any one of them to take the position.

It is not known whether or not Mr. Dake would accept the position were it tendered to him. Nevertheless he is being urged strongly for the place. Objection to his appointment was raised in certain quarters on the ground that he formerly had been connected with the Federal Trade Commission. The report to that effect was without foundation. Mr. Dake never has been connected in any way with Federal Trade Commission activities. He is a mining engineer and his experience has been largely on the operating side of the industry.

No One Held Culpable for Orient Explosion

The coroner's jury, after an inquest over the death of two men killed in explosion of Orient No. 1 Mine, West Frankfort, Ill., Nov. 26, held nobody culpable. The evidence showed that the examiner had approved the place three hours before the blast. A small roof fall meantime released a pocket of gas, which was ignited by the open flame lamp of one of the men who climbed over the fall. The thirteen injured men are all expected to recover. Damage to the mine was negligible. A 50-ft. barrier enclosing the panel in which the explosion occurred and a water-soaked haulage-way out of the panel neck combined effectively to stop spread of the blast.

Immigration Conference to Be Held in New York

The National Industrial Conference Board is arranging a conference on immigration policy to be held Dec. 13 and 14, 1923, at the Hotel Astor, New York City.

The Per Centum Limit Act of May, 1921, with subsequent amendments, which regulates the influx of most of the immigration to the United States, will expire by statutory limitation on June 30, 1924. Extension or modification of this act or substitution of a new law by Congress is therefore necessary.

This National Immigration Conference will give interested persons, in their individual capacity or as representatives of organized groups of society, an opportunity to express themselves on this important problem.

A cordial invitation is extended to all organizations dealing with economic and social problems to appoint delegates and to call the conference to the attention of their members in order to obtain their individual attendance and interest. The National Immigration Conference offers opportunity for cooperation in a most valuable public service.

Anthracite Rate Hearing On in Washington

Examiner Butler reopened the Interstate Commerce Commission's hearings on anthracite freight rates in Washington on Dec. 3 with a proposal to open to New England and North Atlantic states the soft coal produced in southern West Virginia.

C. J. Goodyear, traffic manager of the Pittsburgh Coal Producers' Association, testified that Pennsylvania could furnish all of the coal required as a substitute for anthracite in this territory. He further declared that it would be a waste of transportation to make rates from southern West Virginia that would provide for carrying coal all rail across the bituminous fields of Pennsylvania to New England.

Hoover's Year Book Is Out

Hoover's Commerce Year Book is off the press. It is a companion volume to the annual statistical abstract, which for years has been a standard reference book. The Year Book interprets figures instead of merely setting them forth.

Business is a great network of interrelated activities. The most effective conduct of any one of them requires a knowledge of trends in other trades. These are furnished in the Year Book. The initial volume covers the calendar year of 1922 and the first half of 1923.

A condensed summary of the broad conclusions based on the figures contained in the book follows:

"The year 1922 was one of marked recovery in industry and business, but agriculture still lagged in recuperation. The special impulse toward recovery, aside from the cyclic swing from acute depression, undoubtedly lay in the shortage of construction during the war and the stimulation given to other industries by the activity of the building and construction trades in the period which followed the war's close. Production of manufactured goods was one-fifth greater in 1921 and only slightly less than in the boom years of 1919 and 1920.

"The increased demand for goods led to an advance in prices, though far less sharp than the preceding drop from the abnormal levels of the war and the immediate post-war years. Wholesale prices for 1922 averaged only a trifle higher than for 1921, but the general index at the close of the year was 13 per cent above that at the beginning. The low prices of farm products during 1921 had been one of the contributing causes of the general depression of business. The prices of these products rose nearly 20 per cent during 1922, and this advance helped in considerable measure to restore the buying power of the great agricultural community and thus to promote general prosperity.

"The one important element in American business to fall off in 1922 was export trade, which declined both in value and in volume, as compared with 1921."

Effort at State Coal Control a Fizzle Is Washington View

Abortive Meeting of Governors Seen Merely as Part of Pinchot Political Program—Belief Is That Pennsylvania Would Dodge Anthracite Regulation but Continue to Milk the Industry

By Paul Wooton
Washington Correspondent of *Coal Age*

The effort of Governor Pinchot to obtain concerted action among certain of the states, looking to the regulation of the coal industry, is regarded in Washington as having been a fizzle. The failure of such a large proportion of the Governors invited to attend is as significant, it is held, as the inability of the meeting to agree on a program.

The tendency in Washington is to regard the meeting simply as a step in Governor Pinchot's political plans. Anyone with a grain of political sense, it is contended, must have known in advance that the meeting could not attain its ostensible objective. It did obtain wide publicity for dispatches associating Governor Pinchot's name with an effort to regulate the coal industry, and called attention again to the fact that he has declared war on the anthracite operators.

There is some amusement occasioned by the unexpected turn affairs took when it was suggested that the Pennsylvania Governor possesses all the authority necessary to impose regulation upon the anthracite industry. As one man put it, the Governor was bumped in the face with his own boomerang.

Hard to Get Joint State Action

The meeting accentuated anew the great difficulties of obtaining joint action on the part of individual states. Theoretically the states collectively possess all the powers of the federal government, but with Legislatures meeting at different times, with different political parties in control, and with the inertia which characterizes so many state administrations, there is little likelihood of getting results, even on a proposal as popular in states consuming hard coal as is the regulation of the anthracite industry.

Just at this time many bituminous operators are laying emphasis on the contention that the federal government does not have the power to regulate their business, particularly where sales are made at the mine. In that connection the thought is expressed that the day may come when they would prefer federal to state regulation. In the case of the railroads there was determined opposition to federal regulation. There was a feeling that the states would be more liberal to them. When the separate commonwealths really got into action, the railroads soon found that federal regulation was much to be preferred to state regulation. The activities of the state railroad commissions recently were referred to as being "pestiferous" by a spokesman for the railroads.

In so far as anthracite is concerned, however, it is apparent that neither Pennsylvania nor Governor Pinchot has any desire to undertake the regulation of the production of anthracite coal. The expense of such an undertaking would exceed by many times any saving which might result to consumers in Pennsylvania. Moreover there would be objection to action which might interfere seriously with the functioning of one of the state's most important industries. The attitude of the people of Pennsylvania would be to pass the buck, in the matter of regulation, to the federal government and continue to milk the industry for heavy taxes.

Congress again is in session. It will be interesting to note whether the trend of sentiment in that body is toward the Federal Trade Commission-Interstate Commerce Commission type of profiteer-chasing regulation or toward the Department of Commerce-Department of Agriculture type of voluntary returns.

The failure of Governor Pinchot's meeting, however, will accentuate the impracticability of attempting regulation by the states and will be pointed to as evidence that the only alternative is federal regulation. Activity on the part of the coal trade in opposition to any form of federal regulation simply would play into the hands of the regulationists, many think.

Shipping Board Bids Show Upward Tendency

Bids were received and opened Nov. 28 by the U. S. Shipping Board at New York City, for furnishing and delivering alongside vessels, New York harbor, 2,300 gross tons of either Pool 9 or Pool 71 bituminous coal, delivery to be made Dec. 5. The following bids were received: Seiler Coal Co., $4.91 per ton; Penn Fuel Co., $5.09; Seaboard Fuel Co., $5.31; H. B. W. Haff, $5.60; E. Russell Norton, $5.32; M. F. Shea, $5.49; Dexter & Carpenter, $5.22; Imperial Coal Corporation, $5.67; Rhodes Fuel Corporation, $4.80; W. A. Marshall & Co., $5.35; Commercial Coal Co., $5.44; B. J. Lynch Coal Co., Inc., $5.69, and Knickerbocker Fuel Co., $5.50. On a basis of net ton f.o.b. mine the bids received ranged from about $1.57 to $2.36, as compared with $1.02 to $1.97 submitted on Oct. 25, when bids were received for furnishing and delivering 1,800 gross tons of similar quality coal.

Soviet Coal Industry

Ten months of coal production in Russia are reported by the *Russian Review*, published by the Russian Information Bureau at Washington. During that time 9,734,259 net tons, or 539,100,000 poods of coal was produced. In July 153,500 men were employed who produced 50,800,000 poods, or 917,270 tons. This figures just a little less than 6 tons per man per month, or 72 tons per man per year. The fluctuation in the number of men between 133,600 in December, 1922, and 161,300 in June of the present year was due to insufficient and irregular payment of wages, agricultural work, etc.

Budget Increase to Geological Survey and Mines Bureau

The budget submitted to Congress on Monday by the President carries $1,909,573 for the Bureau of Mines and $1,805,272 for the Geological Survey. This represents an increase of $139,873 over the amount appropriated for the current fiscal year in the case of the Bureau of Mines and an increase of $135,082 in the case of the Geological Survey.

The amount recommended for the conduct of the work of the Bureau of Mines on investigation as to the causes of mine explosions and as to methods of mining having a relation to safety is $359,768. This is $33,232 less than the amount appropriated for the current fiscal year.

The sum of $262,300 is asked for the investigation and improvement of mine-rescue and first-aid methods. This is an increase of $51,300 over the amount appropriated for the current fiscal year. In addition, the budget approves the expenditure of $40,000 for the purchase of an additional mine-rescue car.

The budget carries $138,280 for fuel testing. This is $2,280 more than was appropriated last year.

The budget recommends the expenditure of $333,722 by the Geological Survey for its work falling under the technical heading of "geologic survey." This represents an increase of $33,722.

The amount recommended for mineral resources reports is $136,734. This is an increase of $12,484. An increase of $3,000 is allowed for the investigation of the mineral resources of Alaska, bringing the total for that purpose to $78,000.

"The Engineer's Side of the Coal Question" will be the subject of an address by Dr. George Otis Smith, Director of the U. S. Geological Survey, at Lehigh University Dec. 7. While in Bethlehem he will address the Thursday Evening Club of that city on "Independence in Coal."

Miners' Union Less Belligerent as Old Wage Agreement Nears End

Heavy Coal Stocks Above Ground and Idle Mines Believed to Presage Less Excessive Demands—Situation More Favorable to Consumer Than Preceding Last Strike

With the approach of the first of the year, attention in the coal industry is turning to the new wage agreement. While the United Mine Workers have had little to say as to what demands they will make, it is apparent that they are not particularly belligerent. With 76,000,000 tons of coal above ground; with 10,000,000 tons more at the head of the lakes than in any other year and with half the union mines down thus early in the winter, there is certain to be less insistence on increased operating expenditures. Such expenditures could do nothing more than close other mines and divert further business to the non-union fields.

Business Conditions Favorable

There is a tendency to compare the existing situation with that which preceded the last strike. There are some resemblances, but in the main the situation is importantly different. The inclination of the market is in the same direction, but it has not gone so far. The state of general business is much better. Between 10,000,000 and 11,000,000 tons of coal is being produced weekly, whereas production during the corresponding period preceding the last strike was running some 3,000,000 tons lower. Relations between operators and mine workers are nothing like as strained as they were then. There is not the same tendency to cut wages in the non-union fields.

While the demands of the mine workers cannot be forecast, it is apparent that the differences which will arise at the forthcoming wage conference will not be of the same pronounced character as were those preceding the present agreement. The consensus of opinion is that there will be no strike and that the conferences will not be the occasion for any great amount of uncertainty among coal consumers.

Mine Fatalities Dwindle In October

Death Rate from Accidents Falls from 2.79 to 2.64 per Million Tons of Output

Accidents at coal mines throughout the United States during October, 1923, resulted in the death of 153 employees, according to a report by the U. S. Bureau of Mines. With an output during the month of 57,895,000 tons the fatality rate was 2.64 per million tons mined, whereas in September it was 2.79, and in October last year it was 3.83. Of the 153 fatalities during the month, 129 occurred at bituminous mines indicating a rate of 2.62 per million tons, and 24 occurred at anthracite mines, in Pennsylvania, indicating a rate of 2.75. In October last year the bituminous rate was 3.90, and the anthracite rate was 3.48.

The total number of fatal accidents at all coal mines in 1923 to the end of October was 2,059, representing 3.79 fatalities per million tons, as compared with 1,443 fatalities in the corresponding period last year, representing a rate of 4.08. The bituminous rate for the same ten-month periods fell from 3.89 to 3.54, a reduction of 9 per cent, and the anthracite rate declined from 5.75 to 5.26.

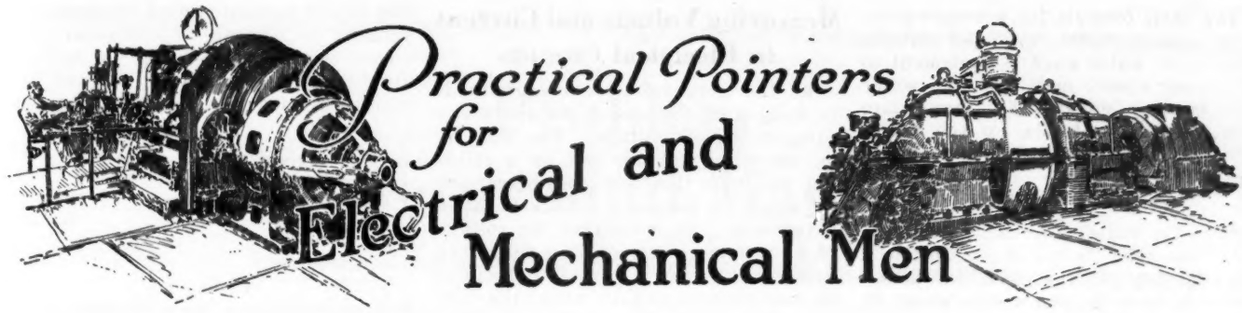
Comparing the record for the first ten months of 1923 with the corresponding period last year, the reports show a reduction in the frequency of deaths from falls of roof and coal, haulage, explosives, and electricity, and an increase in the number of deaths due to explosions of gas and coal dust, as indicated by the following rates per million tons of coal produced:

	1922	1923
Falls of roof and coal	2.015	1.776
Haulage	0.758	0.654
Gas and dust explosions	0.362	0.592
Explosives	0.190	0.160
Electricity	0.187	0.131

Coal Mine Fatalities During October, 1923, by Causes and States

(Compiled by Bureau of Mines and Published by *Coal Age*

State	Underground													Shaft					Surface							Total by States	
	Falls of roof (coal, rock, etc.).	Falls of face or pillar coal.	Mine cars and locomotives.	Gas explosions and burning gas.	Coal-dust explosions (including gas and dust combined).	Explosives.	Suffocation from mine gases.	Electricity.	Animals.	Mining machines.	Mine fires (burned, suffocated, etc.).	Other causes.	Total.	Falling down shafts or slopes.	Objects falling down shafts or slopes.	Cage, skip, or bucket.	Other causes.	Total.	Mine cars and mine locomotives.	Electricity.	Machinery.	Boiler explosions or bursting steam pipes	Railway cars and locomotives.	Other causes.	Total.	1923	1922
Alabama	4		5										9								1			1	1	10	10
Alaska																										0	0
Arkansas																										0	1
Colorado	1	1	1	6									9													9	0
Illinois	3		6		2								11													11	13
Indiana	2					4							6													6	6
Iowa	2												2													2	1
Kansas	2												2													2	1
Kentucky	3		2	1				1					7										1		1	8	13
Maryland	1												1													1	1
Michigan																										0	0
Missouri	1												1													1	1
Montana																										0	1
New Mexico	4												4													4	1
North Dakota																										0	1
Ohio	5		3									2	10											1	1	11	18
Oklahoma																										0	10
Pennsylvania (bituminous)	15		5			1		1		1			23						1						1	24	42
South Dakota																										0	0
Tennessee								1					1													1	4
Texas																										0	1
Utah	1												1													1	4
Virginia	3												3											1	1	4	3
Washington								1					1													1	1
West Virginia	18	1	6					2		1			28								1			2	3	31	40
Wyoming		1								1			2													2	3
Total (bituminous)	65	3	28	7	2	5		6		2		2	121						1		2		1	4	8	129	176
Pennsylvania (anthracite)	17		2	2		1						2	24													24	31
Total, October, 1923	82	3	30	9	2	6		6		3		4	145						1		2		1	4	8	153	
Total, October, 1922	86	25	40	9	1	12		11		2		4	190	1		1	2	4	2				1	9	12		207



Keep Belt Efficiencies High Lest Heavy Losses Result

Just a short time ago I was in a plant where a steam engine drove a main shaft by means of a belt, the shaft running through a wall and carrying power into an adjoining room. From that shaft a second line shaft was driven, and so on to the farthermost end of the room. I did not count the number of belt trains, but am sure there were at least eight and perhaps ten of them. In all my experience with belts I do not remember seeing as glaring an example of wasted power as I saw in this plant.

Assuming the efficiency of each unit drive to be 80 per cent and that the number of units or trains is 10, we must multiply 0.80 by itself ten times to get the efficiency of the complete system. In other words, the over-all efficiency of the drive from end to end is less than 11 per cent, which is surely too low an efficiency to sanction, these days.

One of the machines driven by the sixth train required about 20 hp. for its propulsion. After six trains it is easy to compute the efficiency of the transmission line to be about 25 per cent. The power generated by the engine to drive this machine was therefore 80 hp.

Now, if a rope drive had been installed from the engine direct to this machine it would have been possible to attain a much higher efficiency than 25 per cent. Let us assume then an efficiency of 80 per cent could be effected with a rope drive of this kind. The power required of the engine would therefore be only 25 hp. In other words, the power saving would be 55 hp.

Another way to surmount this evil is to install group drives. Let the engine drive a generator and then distribute the current to motors scattered here and there over the plant. The efficiency of the generator should be at least 90 per cent and the motor the same. The over-all efficiency of the electric drive will, therefore, be very close to 80 per cent. From one of these motors one can therefore run a belt and get a high ratio of power to the driven machine.

Believing this subject to be important enough to warrant further elaboration I have developed a chart, which is shown herewith. By simply stretching a thread across the chart horizontally from left to right the reader is enabled to determine the over-all efficiency of any number of belt transmissions train, assuming an average efficiency for the units.

Above the chart is shown a train of ten belt units, beginning with a driven pulley. This is shown only to explain the chart more clearly. Above each column is a figure giving the number of units in the train up to and including that column.

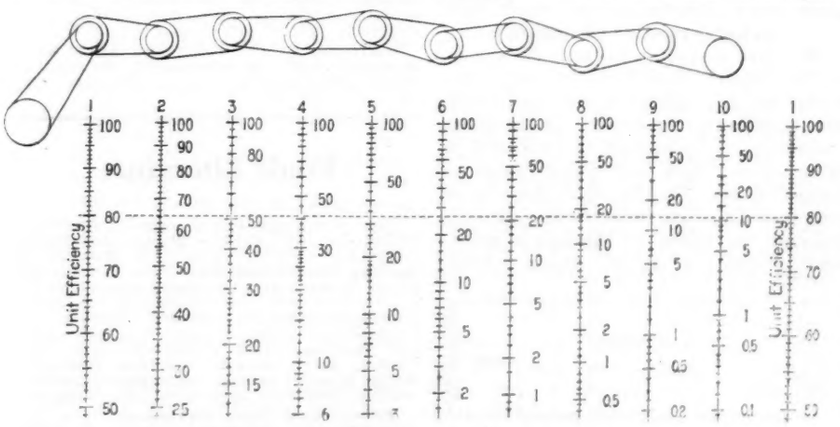
For example, let us determine what are the efficiencies at the various points where the unit efficiency is 80 per cent. The dotted line drawn horizontally across the chart shows the answer at the points of intersection with the various columns. It will be noted that the columns at the extreme left and right are both marked "1". They are identical, to insure an accurate horizontal line. Thus where the unit efficiency is 80 per cent, connect the 80 and the 80 in these two columns as shown.

At the end of the second unit it will be noted that the over-all efficiency is 64 per cent; at the end of the third unit, 51 per cent; at the end of the fourth unit, 41 per cent; at the end of the fifth unit 33 per cent, and so on. At the end of the entire train of ten units, the over-all efficiency is very close to 11 per cent.

This chart shows another interesting thing with regard to efficiency: The higher the efficiency in a unit the higher the over-all efficiency. Thus if 100 per cent efficiency were attainable there would be no loss from one end of the train to the other. With 98 per cent, which is attainable with carefully aligned shafting, properly treated belts, high-class bearings, proper lubrication, etc., it is possible to transmit 80 per cent of the initial power through the train of ten units. But where the unit efficiency is as low as 50 per cent the over-all efficiency is only one-tenth of one per cent. That is, if 1,000 hp. were delivered by the first pulley only 1 hp. would "get through."

Power leaks away at a surprising rate where efficiencies are low. If belt trains are necessary, and if much power is transmitted, make the efficiency of each unit as close to 100 per cent as possible.

W. F. SCHAPHORST,
Mechanical Engineer.



EFFICIENCIES OF BELT SYSTEMS

This chart shows the power transmission efficiency of any number of belt units. The example shows that if the efficiency of each unit is 80 per cent, the second belt delivers 64 per cent of the original power, the third belt 51 per cent, and so on. The tenth belt delivers only about 11 per cent of the initial power put into the system.

Calculating the Fan Drive and Horsepower on the Air

What is meant by the expression, horsepower produced on the air by a mine ventilating fan?

In fan drives there is first of all the horsepower of the driving machine, which usually is slightly greater than the horsepower delivered to the fan because the driver should not be overloaded and some reserve capacity always is desirable. Then again, there is the horsepower taken by the fan, which always is greater than the horsepower delivered by the fan. The horsepower on the air is the rate at which work is actually put on the air—that is, the power put into the fan minus the losses.

For example, what is the horsepower producing ventilation when the volume of air circulating is 60,000 cu.ft. per minute and the water gage 3 in.?

The basic formula for horsepower is, 1 hp. equals 33,000 ft.-lb. per minute. Since 1 in. water gage is equivalent to 5.2 lb. per square inch, and 3-in. water gage is equivalent to 15.6 lb. per square inch, then the formula for the horsepower on the air is

$$\frac{60{,}000 \times 15.6}{33{,}000} = \text{roughly } 29 \text{ hp.}$$

Here the horsepower on the air is a little less than 29 and if we assume a fan efficiency of 70 per cent the horsepower to drive the fan will be about 42. The driver will therefore have to be capable of developing at least 42 hp. continuously.

Maintaining Trolley Wheels And Eliminating Troubles

Being a "trouble shooter" for an electrical contractor, I am naturally interested in the letter of Frank Parker, mine foreman at New Castle, Ala., which appeared in *Coal Age*, Nov. 8, stating his experiencing trouble with the trolley wheels used on his Baldwin-Westinghouse locomotive.

It has been my experience that the following troubles are the cause of practically all trolley-wheel sparking: low voltage caused by leaks to ground or too small wire; motors overloaded, bad return, bad contact—that is, the groove may be too wide for the size wire used or the tension of the wheel on the wire may be insufficient; the tension should be from 15 to 25 lb. measured at the wheel. This may be measured by hooking an ordinary spring balance to the harp and pulling downward.

The scale should be read just as the wheel leaves the wire. If in this case the harp does not line properly with the wire, it can be loosened and turned with a pipe wrench. Moisture, sleet or ice will cause sparking, of course. The last-named reasons are not to be considered for mine operation and Mr. Parker states that there is no moisture in the mine where he is experiencing trouble.

I would like to give a few points on the care of trolley wheels. They should be oiled about every 35 miles, which will save both spindle and bearing. There should not be too much side play and a wheel with badly worn spindle or bearing should be renewed. It is not economy to renew a wheel without renewing spindle or shaft, save in exceptional cases.

The stock of repair parts for trolleys should consist of wheels, shafts, cotter keys, bushings, harps and the proper washers, if required. The number depends on the character of service and the number of locomotives operated. It is general practice at the larger mines to keep a spare pole completely fitted with base and harp so that it can be readily substituted for a broken pole, thereby saving a delay.

GRADY H. EMERSON,
Electrican.
Electrical Repair & Service Co.
Birmingham, Ala.

Measuring Voltage and Current In Electrical Circuits

In the generation of electricity it is first of all necessary to produce a pressure called voltage. The unit by by which we measure voltage is called the volt, and therefore the instrument by which we measure voltage is called a voltmeter. In measuring the voltage of an electrical system, it is necessary first of all to use a voltmeter designed to read voltages slightly above the voltage of the line. The method of determining the voltage of a line consists of placing the two voltmeter leads between

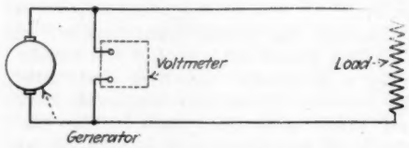


FIG. 1—MEASURING VOLTAGE
The voltmeter terminals are connected directly across the line to measure the line voltage or the potential difference between any two points on the circuit.

the two points where the potential difference, or voltage difference, is desired. Usually this will be between two metallic conductors, frequently being between two copper conductors. This need not always be the case, however, because in some conditions one conductor may be metallic and the other may be through the surface of the earth, commonly known as "ground." In street-railway work and in mine-haulage work the trolley wire is one conductor and the rail is the other conductor, and since the rail has direct contact with the earth we may also say that the trolley wire is one conductor and the earth is the other conductor.

In measuring voltage of a direct-currrent line, care should be taken to connect the voltmeter in such a way that the deflection of the needle will be in the proper direction. If this is not done, the needle will tend to turn in the opposite direction and may cause damage to the instrument. Direct-current voltmeters have what is called a polarity marking. This marking enables one to determine just which wire or conductor is positive or negative.

We have said that the unit of current is the ampere, therefore the name ammeter has been given to the instrument for measuring amperes. To measure the number of amperes, or rate of flow in a circuit, this instrument must be placed either directly into the circuit so that the current flows directly through the meter, or through a resistance element of known value. When

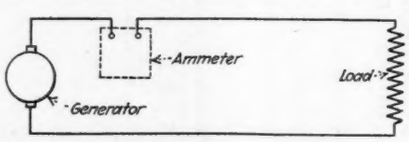


FIG. 2—AMMETER CONNECTION
To determine the amount of current flowing in the line the ammeter is inserted directly into the circuit so that the load current passes through the meter.

this second method is used the ammeter actually is a form of voltmeter and measures the voltage drop or voltage difference between the two ends of the resistance element. In this case the

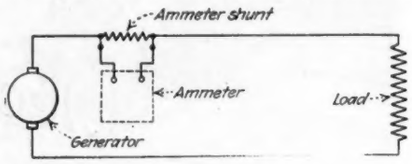


FIG. 3—ANOTHER WAY TO MEASURE THE CURRENT FLOWING IN A LINE
Here the main current passes through a resistance element of known value and the ammeter actually measures the voltage drop across this resistance. The meter, however, is calibrated in amperes and reads direct.

meter is calibrated to read amperes because there is a definite relative between the voltage drop across the resistance and the current passing through it.

City of Vancouver to Go Into Coal Business

Determined to break the monopoly of the Vancouver Island coal producers, the city of Vancouver has decided to enter the coal business, selling to its citizens at cost plus cost of weighing and sacking.

Alderman R. P. Pettipiece, in control of the new department, states that he has an offer of 30,000 tons of coal from the Princeton-Nicola field for $7.90 delivered or 40c. per ton more sacked. He says the Crow's Nest Pass Coal Co. offers to deliver coal at Vancouver for $9.35 per ton. This coal has to travel more than 400 miles by rail, whereas the yards are selling Vancouver Island coal, from mines less than 60 miles distant by water, for $12 per ton.

Publications Received

A.S.T.M. Tentative Standards, 1923. American Society for Testing Materials, Philadelphia, Pa. Pp. 859; 6x9 in.; illustrated. Contains 170 tentative standards relating to a number of different subjects, among which are preservative coatings, timber, insulating materials, timber, coal and coke. Price, $7 in paper; cloth, $8.

Biography of Petroleum and Allied Substances, by E. H. Burroughs, Bureau of Mines, Washington, D. C. Bulletin 220. Pp. 230; 6x9 in.

Trade Literature

The Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., has issued a 24-page booklet, entitled **A Material of Endless Possibilities,** containing information about Micarta and the many uses to which it has been put, and indicating the possibilities for other applications. Some of the products for which Micarta is already used are bushings, cord terminals, disks, fan blades, gears, gaskets, handles, insulators, knobs, pinions, pulleys, radio panels, switchboards, telephone apparatus, and washers.

Jeffrey Coal Mine Equipment. The Jeffrey Mfg. Co., Columbus, Ohio. Catalog No. 386. Pp. 130; 7 x 10 in.; illustrated. This book is made up of four sections, No. 1 covering mine locomotives; No. 2, coal cutters, loaders and drills; No. 3, mine fans; No. 4, tipple equipments.

Problems In Underground Management

Fireboss Should Defend His Safety Rights, Receiving Company Aid

Shotfirer Discharged for Refusing to Fire Unsafely Charged Holes—Miners Will Charge Shots for Others to Ignite Which They Would Not Fire Themselves

By W. H. Luxton
Linton, Ind.

The right not to fire an unsafe shot is an equity of the shotfirer for which he should fight. I recall some years ago a man who was killed as a result of his recklessness in overcharging a hole. Following close on the heels of five or six other men he was hurrying out of the mine. The shot he had lighted proved to be a windy one, and the concussion of the air caught the man just as he was passing through a two-way door, and he was killed. Investigation showed that he had not properly mined his shot, which negligence cost him his life.

Not so long ago a shotfirer was discharged because he refused to fire several shots that could not be considered safe. Miners often drill and charge holes to be fired by a fireboss which they would hesitate to fire themselves. That shotfirer probably owes his life to his refusal to fire unlawful shots.

Asked to Accept Risks

Such is the urgent demand for coal that many firebosses hold their positions because of their willingness to take great risks. One man I know was told by a friend when firebossing in a gassy mine that he probably would be "let out" because he was too careful. Up to that time the records showed that no one had been burned by gas in that section of the mine. The fireboss finally left because the officials at the mine failed to co-operate fully with him in demanding safety.

Within a month or two thereafter, one poor fellow was blown into the sump and his buddy was injured by a car being blown upon him by a local explosion of gas in the place in which both men were working. Soon after that another explosion occurred in the same mine, causing much damage to the workings. Fortunately, no lives were lost.

If mine officials would share the burdens and responsibilities of their firebosses and shotfirers the work would not be unreasonably hazardous. The operator often may be well pleased to have the shotfirer fire all shots, safe or unsafe, and have the mine in shape for full operation on the following day; likewise he may be pleased to get a good report on the condition of his mine from the fireboss, but after all he has to pay the compensation if an accident happens and he cannot afford to ask any man to take unnecessary risks or to be complacent as to conditions that may result in an accident.

Are There Any Dangers in Electrical Blasting?

A mine superintendent writes, saying: "Some have suggested changing the system of firing shots in use at our mine. What are the dangers of blasting coal with electricity, provided, of course, compliance is made with the mining law?"

The chief danger in the use of electricity for blasting coal in the mines lies in a faulty installation of the wiring system. The wiring of a mine should always be in charge of a competent mine electrician who is fully acquainted with mining conditions and requirements. Imperfect installation of the wires at any point may weaken the current below what is required for safe blasting.

Beware of Short-Circuits

Care should be taken that the wiring intended for locomotives, mining machines, pumps and signaling shall be so located with regard to the shotfiring system that by no possibility can the former energize the latter, even if either should fall on the other. The connection to the surface must be through two switches kept under lock and key, the key for one switch being held by the power-house engineer and the other by the shotfirer. Arrangements must be made that, except when the shots are to be fired, the circuits shall be so broken that no lightning discharge bridging the gaps on the switches can pass a current into the mine. At some mines it has been found that attempting to fire all the shots at once causes those that are delayed to explode into a dust-laden atmosphere. Methods have been adopted to delay the shots in any series of rooms so that the first shot fired will be in the return current from the other unfired shots and the second in the return current from the others, and so on. Thus each shot will be fired in clear air.

All Men Must Be Checked Out

There is always the danger that all the men may not be out of the mine when the shot is fired, and a result one or more may be killed. Care should be taken to place the shotfiring cabins where those throwing the switch will be out of danger. Persons also should be prevented from standing near the mine mouth when shots are being fired. Unfortunately, where a mine has a shotfiring system from the surface such as described, the miners are prone to think that as only property is menaced, and as that property is not theirs, they are at liberty to charge their holes at pleasure.

When a portable battery is used for firing, the strength of the battery must be sufficient to detonate the charge readily. Too weak a battery or the use of electric fuses of inferior strength may cause a misfire or start a deflagration in the charge, resulting in a hangfire, which always is dangerous. The lead wires running to the shots should never be connected with the battery until all other connections are completed and due warning has been given to prevent anyone from approaching the zone of danger. The battery should be locked in a manner that will prevent anyone from meddling with it and the key should be in the possession of the man firing the shots.

Extinguished Carbide Light Nearly Ignites Gas

By E. S. Wade
Superintendent, Windsor Power House Coal Co., Warwood, W. Va.

Strange indeed was an accident described at the Panhandle Mining Institute of West Virginia. The fireboss made his round of the workings and found gas in the entry. In consequence he marked this working place as dangerous. On returning on his second round he went to this entry to make arrangements for the removal of the gas. When he got to this point he found the wireman standing near the danger board.

He told the fireboss that he had never seen gas act on the flame of a

safety lamp and that he was curious to see the cap it made.

As there was not much gas in the entry the fireboss consented to take him in with him, so he told him to blow out his carbide lamp. The fireboss started up the entry with his safety lamp, the wireman following close up behind with his extinguished carbide lamp in his hat. About half way up to the face of the entry the wireman stumbled on a lump of coal or a tie and fell forward.

The fireboss being right in front of him the wireman's carbide lamp scraped down the fireboss' right arm, turning the igniter and lighting the lamp. Fortunately the gas was near the roof and not low enough to be ignited. A severe explosion was avoided only by a hair, however, and the narration of the event may serve to warn others against the danger of taking even an unlighted carbide lamp which is generating acetylene gas into the presence of firedamp. It should be remembered that unburned acetylene gas adds combustibility to the atmosphere even if in only minor degree.

Use Suitable Gloves, Caps and Shoes to Avoid Accident

Co-operation between coal companies and mining inspectors is the keynote in the West. There the operators are trying to contrive with inspectors to get the best laws, however stringent, that will prevent accidents. In consequence the Rocky Mountain Coal Mining Institute is taking up the old question of safety and has had three reports from the members if its Safety Committee. That from P. F. Patterson, mine inspector of the State of Wyoming, and G. A. Knox, general superintendent, Gunn-Quealy Coal Co., gives special attention to gloves, caps and shoes. They say: "No habit is becoming more prevalent among miners and other mine workers than that of wearing gloves, principally flimsy canvas gloves, which afford no protection to the wearers and are the direct cause of many hand injuries. If gloves must be worn, and no doubt they will be, as the habit has become well established, they should be made from some heavy material and should fit the hands fairly snugly.

Would Change Miner's Cap

"With the many accidents to the head from falls of roof and coal, it would seem timely to suggest a change in the miner's cap. One made from fiber or light metal in the form of a helmet would seem preferable to those now being worn. Some such caps as these, we understand, are used to some extent in metal mines and their use in coal mines would no doubt cause a decrease in the frequency of certain accidents. It is a known fact that many fatal accidents have been caused by the fall of small pieces of rock that no doubt would not have proved fatal if the miner had been protected by some such headgear.

"Many accidents occur, too, from employees wearing shoes too light for their work, generally discarded dress shoes which afford no protection to the feet. The nature of mine work demands a shoe of heavy and rugged construction. The general wearing of such a shoe would no doubt cut down the number of accidents to the feet. A heavy hobnailed shoe, similar to the trench shoe worn by our troops in Europe, is in general use in the mines of Great Britain and Continental Europe. The shoes which mine workers wear in American mines are little better than moccasins and afford no protection to the feet and cause numerous accidents."

Robert Sneddon, of the Diamond Coal & Coke Co., Diamondville, Wyo., discussing this question, said that at Superior, Wyo., four years ago drivers and track laborers had many accidents from wearing shoes with hobnails in them. The nails destroy the hold the foot has on the car bumper and the men in consequence fall off the trip and are hurt.

It may be added that it is because of the greater danger of slipping when the foot is covered with a resistant sole that sailors go unshod. The hobnails further decrease the hold on any hard, especially a pitching, surface. Still, something may be said nevertheless for better protected feet.

Timber Bill May Be Reduced By Good Judgment

Before long we shall attempt economies in timber that hitherto we have not even considered. Even today the timber bill is one of the harassing problems of the coal producer and worthy of careful consideration. Because we have been wasteful for years is no reason why we should continue to be so, now that timber is becoming scarce.

All permanent timber should be treated with a preservative. Much valuable timber can be saved if the props and timber sets which are broken a short time after setting are reclaimed, the broken ends being used for propping thinner seams, being cut into cap-pieces, wedges or ties or being used for building cogs or chocks.

Hundreds of thousands of good timbers are lost every year in the mines through the carelessness of miners who let them lie in the waste until they are finally buried. A careful watch kept by officials in their daily rounds will do much to reduce the loss of good timber. The timber sent to a working place should be of the proper length, for the miner, if he finds the timber is too long or too short, is likely to throw it into the gob. Emphasis should be laid on the importance of drawing all timber in a systematic manner as the pillar retreats.

In pitching seams the recovery of timber is far more difficult and dangerous than in flat seams, for in such cases the rock from which the timbers are withdrawn is higher up the inclination than the men drawing it and whatever rock falls may slide down the slope and injure them. Nevertheless, many timbers can be recovered by selecting those posts here and there which have the least weight upon them. A small percentage of recovery of timber on pitching seams makes a marked reduction in costs as the handling of timber to the working faces is an expansive item.

In conclusion, it may be said that one of the best ways to conserve timbers is to establish some standard system of retreating. Thus less timber is used and whatever posts or crossbars are set for protection can be reclaimed before they become rotten, which is not usually done under the methods now general.

Are More Careful of Dust In Europe

John T. Ryan, speaking at the recent Salt Lake City meeting of the Rocky Mountain Coal Mining Institute, said that the regulations in Europe in regard to the handling of coal dust were better than ours. The British require that dust in the mines contain at least 50 per cent of incombustible matter and in Belgium and France not less than 70 per cent.

At the working faces, where rock dust would spoil the coal, water is used to keep down the coal dust. In France, where the mines are worked under concession and the operator shares his profits with the government, the mine inspectors have a word not only in safety but also in operating. The miners are required at these mines to sweep up the coal, and after that is done they water the working place.

In some places the crushing plants are underground and the material for crushing is derived from the workings themselves. The usual way of distributing the dust is to place it in boxes at intervals, possibly 1,000 or 1,500 ft. apart. Compressed air is turned on at night when few men are in the mine, and the dust is spread in a cloud over every exposed surface.

Color an Index of Safety

The degree of effectiveness of the dusting can be readily told by the color of the floor, as the dust is white. At some mines this dusting is done once in six months, in others once a year. Some use a car with a small fan operated by one of the axles of the wagon. The fan furnishes the air for blowing out the dust. In Yorkshire a new method of distribution is being tried. A 12-in. pipe is laid, and a fan forces rock dust through it. Ducts at intervals lead into the mine roadways. Properly installed it should be cheaper to operate than a water sprinkling system. In fact it is thought that it can be run for half the cost. In France dusting costs about half a cent per ton and in England about a cent. Rock dusting was essential in Europe, for the mines were too hot to make it advisable to moisten the air by the use of water or steam.

Discussion

How to Mine Seam of Pitching Coal with Heavy Parting

Slate Can Be Blown Down and So Disposed as to Permit Chutes to Be Laid from Coal Face to Top of Car

By J. W. Powell
Contracting Engineer, Welch, W. Va.

An anthracite mining engineer asks in the issue of *Coal Age* of Nov. 15, p. 742, how timber may be recovered in a bed pitching at an angle of 25 deg. where chambers have been driven up in a 7-ft. seam overlaid by a rock parting 3 ft. thick and covered by a seam of coal, the thickness of which he does not state but which I assume is 4 or 5 ft. He says that the parting slate is blasted down on the retreat and that the top bench is brought back at the same time. It would seem that conditions are ideal for recovering any timber placed during the driving of the chamber.

My method of reclaiming the timber would be as follows: When the chamber has reached its ultimate length, a line of breaking holes should be drilled in the rock parting across the entire width of the chamber and back about 6 ft. from the face. This would enable the miner to get the proper angle for breaking the rock. Plenty of holes should be drilled in this round as the rock does not have a loose end. By thus shooting the rock adequately a clean cut will be insured clear across the face up to the top bench. This is an important requirement.

After all the holes are drilled, the props which stand under the section of parting rock covered by the range of shots should be pulled, which can be done quite readily by using any approved type of post puller. They will not have any great weight on them, being so close to the solid coal face. The total weight in any case will not be more than that of the 3 ft. of parting rock, for the top rock is stated to be solid and to form an excellent roof.

After this section of roof has been blasted another series of holes should be drilled in the parting roof so as to make the total length of roof broken down extend 20 ft. back of the face. All posts then can be pulled with safety, a post puller being used for that purpose, and any that are under too heavy a weight for such displacement can be blasted out by small plug shots set under the foot of the post. This latter it would be quite possible to do in a seam of this degree of inclination.

If the layer of roof above the lower bench was softer than the floor, however, the plug hole should be put above the post. This section of parting rock being blown down, the rock should be graded so that main and wing chutes can be laid to convey the coal in the top bench to the car in the roadway as it is shot down. Then it will be possible to commence to retreat with the top bench. This top coal, as experience shows, will come down in large lumps as soon as a loose end is obtained and it can be loaded from the top of the fallen rock into the chute or car with little loss of coal. The rock in this way will not have to be removed and this will reduce the cost of obtaining the coal.

How to Save Timber and Time

By a Safety Inspector
Welch, W. Va.

Blasting timbers with dynamite may be necessary at times and when the proper precautions are taken it is in some cases the safest method of removing them. It is done quickly and the time saved will often pay for the loss of timber. In general, however, the use of the post puller is much to be preferred, as thereby the post can be recovered in shape to be used again. The improvised battery ram in the form of a long timber swung on a rope is not a desirable way in which to remove timbers. In determining the way to remove a timber the cost of the method must be taken into consideration. That cost may easily exceed the price of new material.

Time costs are too frequently not given enough consideration. In many cases trackmen are required to pull and straighten spikes. It is doubtful economy when we consider the time required to make them fit for re-use.

We should never try to recover material until we are satisfied that it will pay to do so, taking into account the depreciation of the used material. Some companies lose money by abandoning good equipment and supplies. On the other hand, money often is lost in the attempt to recover material, which is then frequently used at a disadvantage because of its poor condition.

Other losses in company work occur when drawing back pillars. Sections of track frequently are taken up and deposited in a place where they will soon have to be moved again. They should be put where they will be out of the way until needed in another place. It may happen that material thrown aside in the manner mentioned will be covered up by a fall and lost beyond recovery.

One often sees places driven where the waste is thrown against the pillar only to be moved again when the rib is drawn back. These and other items occurring in the daily operation of mines may seem mere details, but in most cases they represent the difference between profit and loss.

Should Fireboss Be Examined At the Working Face?

In view of the frequency with which firebosses fail to detect firedamp it is permissible to call attention to the last paragraph of Art. 24, Sec. 4, of the Bituminous Mining Law of Pennsylvania which reads:

"Certificates of qualification of firebosses shall be granted to persons who have given to the Board of Examiners satisfactory evidence of their ability to perform the duties of firebosses in gaseous mines, and who shall have received an average of at least 65 per cent in the examination, and shall also have undergone an oral examination in the presence of explosive gas."

I am informed by candidates who passed the last examination and have received certificates issued by the Board of Examiners, making them eligible for appointment to the position of firebosses in the bituminous mines of this state, that they were not submitted as the law requires to an "oral examination in the presence of explosive gas."

I question whether the papers of these men are valid, for they were not examined in strict conformity with the requirements of the law. This I believe is necessary to render their appointment lawful.

Our old firebosses, who are all certified men, tell me that they were required to demonstrate their ability to detect gas by a practical test in the mine. Naturally, I cannot blame them for questioning the right of these men to appointment—*Superintendent.*

Rapid vs. Correct Way of Calculating Arc

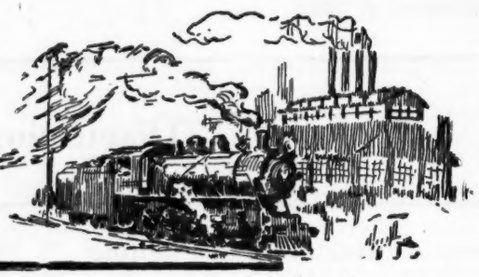
To settle a dispute regarding the correct method of calculating the length of a circular arc, kindly explain the right way of making such a calculation. I want to find the length of an arc of 30 deg. on a circle whose radius is 14 ft. I have been solving this problem as follows: The full circumference of the circle is $2 \times 3.1416 \times 14 = 87.96$ ft. Then, dividing this by the 360 deg. forming its circumference gives for the length of an arc of 1 deg., $87.96 \div 360 = 0.244$ ft. Finally, multiplying this by 30 gives for the length of an arc of 30 deg., $30 \times 0.244 = 7.32$ ft.

Others claim that to solve this problem correctly I should multiply the sine of 1 deg. by 14 and that product by 30, which gives $14 \times 0.01745 \times 30 = 7.329$ ft.

Cambria, Ill. Student.

Either method gives a result which is reasonably correct though the second method is based on an approximation, for the sine of 1 deg. is not the same as the length of the arc subtended by an angle of 1 deg. Calculated to more places of decimals the results would be more nearly equal than you have shown and the latter method is perhaps a little the more rapid.

Production and the Market



Weekly Review

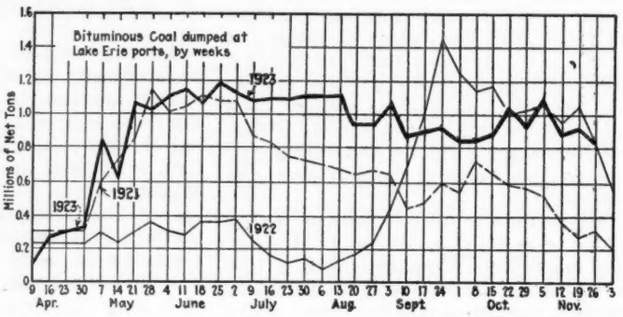
Recent advances in general industrial activity have not been reflected in the demand for bituminous coal. Inquiries have increased, there is some interest in contracts covering the first three months of 1924 and contract shipments are being increased here and there, but spot sales are on a day-to-day basis. Distress coal can be picked up at bargain prices in every market. The National Association of Purchasing Agents has advised its members to hold to present stocks, to buy for current needs while prices are low, coal plentiful and transportation favorable, and to avoid a general rush into the market.

Production of soft coal as well as prices continue to lose ground. Production during the week ended Nov. 24 was around 10,170,000 net tons, an increase of 454,000 tons over the previous, a holiday, week, but a decrease of 555,000 tons compared with the week of Nov. 10. Average prices reached the lowest level for any week of this year, *Coal Age* Index showing 181 as of Dec. 3, a drop of five points from the previous week. The average price was $2.19. Declines registered in Pocahontas, southeastern and western Kentucky, Clearfield, Cambria, Somerset and Kanawha coals were but partly offset by increases in southern Illinois, Springfield, Clinton and Pittsburgh districts. Lump-coal prices suffered the most with mine-run firm in most fields and screenings erratic.

Export Market Shows Signs of Revival

Activity in the export market has revived somewhat. Competition between British and American coal is keen, as is shown by one piece of business last week. A New York house sold a cargo of Kanawha coal to the Bordeaux Gas Works under $5 c.i.f. Inquiries have been received for between 30,000 and 40,000 tons of gas coal for Stockholm, deliveries to extend over next year.

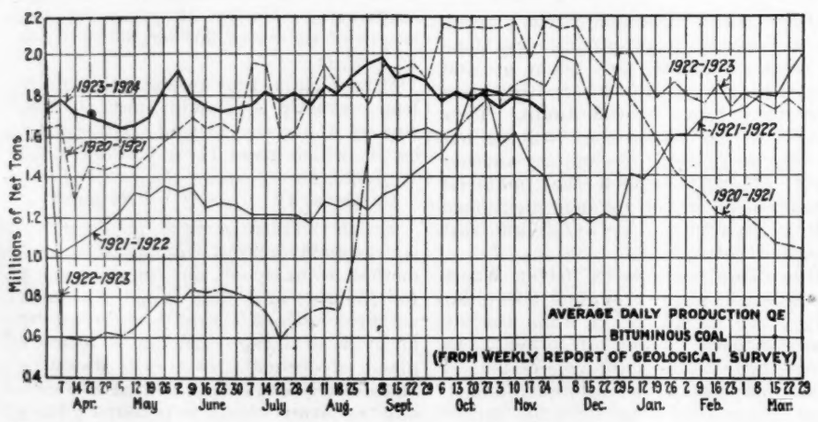
Reduced production in Illinois and Indiana has sent prices for screenings up and the closing of some consumer-owned mines has put the owners on the market for heavy tonnages of steam coal. Working time in the Middle West is decreasing gradually. Little activity is noted in the St. Louis market, except in the cheaper grades of coal handled by retail dealers. The demand for Kentucky coal is going from bad to worse. A better movement is reported out of Duluth, but at Mil-



	Week Ended Nov. 26	Season to Nov. 26
Cargo	776,893	29,067,813
Fuel	38,897	1,561,469
Totals	815,790	30,629,282

waukee the docks are not busy. Trade in Ohio continues dull notwithstanding a readjustment in the circular on smokeless coals. Consumers in New England continue to lack interest. At New York more inquiries were received, including some regarding contracts for the first three months of the new year, but nothing definite regarding prices has been decided.

Anthracite production reached 2,100,000 net tons during the week ended Nov. 24, only 65,000 tons below the high record for the year. It is estimated, however, that production for last week did not exceed 1,800,000 tons, owing to the holiday. More hard coal is being



Estimates of Production

(Net Tons)

	1922	1923
BITUMINOUS		
Nov. 10	10,147,000	10,726,000
Nov. 17 (*a*)	11,215,000	9,717,000
Nov. 24 (*b*)	10,100,000	10,171,000
Daily average	1,683,000	1,695,000
Calendar year	355,050,000	497,901,000
Daily av. cal. year	1,276,000	1,792,000
ANTHRACITE		
Nov. 10	1,897,000	1,967,000
Nov. 17	2,230,000	1,725,000
Nov. 24	2,213,000	2,100,000
Calendar year	44,866,000	86,456,000
COKE		
Nov. 17 (*b*)	264,000	254,000
Nov. 24 (*a*)	288,000	260,000
Calendar year	6,601,000	16,695,000

(*a*) Subject to revision. (*b*) Revised from last report.

delivered to retail dealers in the East now that the Lake shipments are nearly at an end, and as a result of the easier condition of the market some cancellations of the high-priced coal have been reported.

Midwest Steam Prices Stiffen

The remarkably low point of production in Illinois and Indiana has at last begun to have a real strengthening effect on the price of screenings. Good southern Illinois screenings, which have been running at $1.40@$1.50, have climbed about 15c., although there is no great volume moving at that price because of short-term contracts now being cleaned up at the lower figure. Central Illinois screenings have improved, mainly because the Standard Oil Co., having shut down its Illinois mines, contracted for about all the available Springfield district supply of fine coal at $1.25 until April 1. The previous price had been around 70c. Indiana Fourth Vein steam sizes also ascended from an average of $1.35 to $1.60, and Fifth Vein from $1 to $1.25.

The situation in domestic sizes is discouraging. "No bills" in all the larger sizes are accumulating in all fields with no good prospect ahead of moving them in a hurry. This, coal experts contend, is bound to push steam sizes higher. This development is especially desired by two or three operators who have small quantities of screenings on the ground in scattered parts of Illinois, and by most of the many operators who are trying to fill their low-price contracts as quickly as possible so as to have coal ready for a high-level steam market along toward the end of this month.

Kentucky and Eastern coal has been cutting heavily into the domestic market all through the Middle West and Northwest at prices low enough to give them the edge on trading in spite of their higher freight rates. Shutdowns in some of those competing regions, however, are expected soon to reduce the volume of this coal, so that the price will ascend to a point that will reduce their competitive power. Good eastern Kentucky lump is selling at $3@$3.25 and western Kentucky at $2.75, and their producers are hungry for markets now that Lake trade is dying. A flood of cheap smokeless mine-run, selling through the Chicago market at $1.75@$2.25, helps materially to keep the domestic market in Illinois and Michigan flat.

Midwest fields, of course, continue to run on flat tires all

Current Quotations—Spot Prices, Bituminous Coal—Net Tons, F.O.B. Mines

Low-Volatile, Eastern	Market Quoted	Dec. 4 1922	Nov. 19 1923	Nov. 26 1923	Dec. 3 1923†
Smokeless lump	Columbus	$6.50	$4.85	$4.10	$4.00@$4.25
Smokeless mine run	Columbus	6.15	2.15	2.10	2.00@ 2.25
Smokeless screenings	Columbus	5.75	1.30	1.30	1.25@ 1.40
Smokeless lump	Chicago	6.25	5.10	4.50	*4.00@ 4.25*
Smokeless mine run	Chicago	5.60	2.25	2.25	*1.75@ 2.25*
Smokeless lump	Cincinnati	6.55	4.85	4.25	2.75@ 3.50
Smokeless mine run	Cincinnati	5.40	2.10	2.10	*1.75@ 2.25*
Smokeless screenings	Cincinnati	5.30	1.35	1.50	*1.00@ 1.75*
*Smokeless mine run	Boston	7.50	4.40	4.65	*4.50@ 4.75*
Clearfield mine run	Boston	3.50	2.00	2.15	*1.50@ 2.25*
Cambria mine run	Boston	4.25	2.60	2.60	*2.00@ 3.00*
Somerset mine run	Boston	3.85	2.35	2.35	*1.75@ 2.50*
Pool 1 (Navy Standard)	New York	5.25	3.00	3.00	2.75@ 3.25
Pool 1 (Navy Standard)	Philadelphia	5.15	3.00	3.00	2.80@ 3.20
Pool 1 (Navy Standard)	Baltimore	4.85	.....	.....	.....
Pool 9 (Super. Low Vol.)	New York	4.60	2.25	2.35	2.25@ 2.50
Pool 9 (Super. Low Vol.)	Philadelphia	4.65	2.30	2.30	2.20@ 2.45
Pool 9 (Super. Low Vol.)	Baltimore	4.10	2.05	2.05	2.00@ 2.15
Pool 10 (H.Gr.Low Vol.)	New York	4.95	2.00	2.00	1.75@ 2.25
Pool 10 (H.Gr.Low Vol.)	Philadelphia	3.95	1.85	1.85	1.75@ 2.00
Pool 10 (H.Gr.Low Vol.)	Baltimore	3.35	1.90	1.90	1.85@ 2.00
Pool 11 (Low Vol.)	New York	3.00	1.75	1.55	**1.55@ 1.75**
Pool 11 (Low Vol.)	Philadelphia	3.35	1.65	1.70	1.65@ 1.75
Pool 11 (Low Vol.)	Baltimore	3.10	1.75	1.75	1.70@ 1.85
High-Volatile, Eastern					
Pool 54-64 (Gas and St.)	New York	3.25	1.60	1.60	1.50@ 1.75
Pool 54-64 (Gas and St.)	Philadelphia	3.55	1.65	1.65	1.60@ 1.75
Pool 54-64 (Gas and St.)	Baltimore	3.10	1.70	1.70	1.70
Pittsburgh sc'd gas	Pittsburgh	4.85	2.55	2.55	2.50@ 2.60
Pittsburgh gas mine run	Pittsburgh	.....	2.25	2.25	2.20@ 2.30
Pittsburgh mine run (St.)	Pittsburgh	2.60	1.90	2.00	1.90@ 2.10
Pittsburgh slack (Gas)	Pittsburgh	3.25	1.05	1.25	**1.25@ 1.35**
Kanawha lump	Columbus	5.75	3.00	3.00	2.85@ 3.15
Kanawha mine run	Columbus	3.35	1.85	1.85	1.75@ 2.00
Kanawha screenings	Columbus	3.25	.75	.80	.75@ .85
W. Va. lump	Cincinnati	6.25	3.25	3.15	*2.00@ 3.50*
W. Va. Gas mine run	Cincinnati	3.50	1.50	1.50	1.35@ 1.65
W. Va. Steam mine run	Cincinnati	3.15	1.50	1.50	1.35@ 1.65
W. Va screenings	Cincinnati	3.00	.85	.85	*.30@ .75*
Hocking lump	Columbus	5.05	2.90	2.95	2.85@ 3.10
Hocking mine run	Columbus	3.00	1.85	1.85	1.75@ 2.00
Hocking screenings	Columbus	2.85	.90	.80	.75@ .85
Pitts. No. 8 lump	Cleveland	4.50	2.55	2.55	2.15@ 3.00
Pitts. No. 8 mine run	Cleveland	3.20	1.90	1.95	*1.85@ 1.95*
Pitts. No. 8 screenings	Cleveland	2.85	1.05	1.15	**1.30@ 1.50**

Midwest	Market Quoted	Dec. 4 1922	Nov. 19 1923	Nov. 26 1923	Dec. 3 1923†
Franklin, Ill. lump	Chicago	$5.00	$4.10	$4.10	$3.90@$4.35
Franklin, Ill. mine run	Chicago	4.10	2.50	2.35	2.25@ 2.50
Franklin, Ill. screenings	Chicago	2.50	1.45	1.45	**1.50@ 1.65**
Central, Ill. lump	Chicago	4.25	3.10	3.10	3.00@ 3.25
Central, Ill. mine run	Chicago	3.10	2.10	2.10	2.00@ 2.25
Central, Ill. screenings	Chicago	1.65	.85	1.05	**1.25@ 1.45**
Ind. 4th Vein lump	Chicago	5.10	3.35	3.35	3.25@ 3.50
Ind. 4th Vein mine run	Chicago	3.85	2.60	2.60	2.50@ 2.75
Ind. 4th Vein screenings	Chicago	2.25	1.20	1.35	**1.50@ 1.65**
Ind. 5th Vein lump	Chicago	4.75	2.50	2.50	2.25@ 2.75
Ind. 5th Vein mine run	Chicago	3.60	2.10	2.10	2.00@ 2.25
Ind. 5th Vein screenings	Chicago	2.00	.80	.95	**1.25@ 1.40**
Mt. Olive lump	St. Louis	.....	3.10	3.10	3.00@ 3.25
Mt. Olive mine run	St. Louis	.....	2.25	2.25	2.20@ 2.30
Mt.Olive screenings	St. Louis	.....	1.25	1.25	1.25
Standard lump	St. Louis	4.25	3.05	3.05	2.90@ 3.25
Standard mine run	St. Louis	2.60	2.05	2.05	1.80@ 2.30
Standard screenings	St. Louis	1.35	.55	.55	.50@ .60
West Ky. lump	Louisville	3.75	3.00	3.00	2.75@ 3.25
West Ky. mine run	Louisville	2.25	1.65	1.75	*1.50@ 1.90*
West Ky. screenings	Louisville	1.50	.60	.65	**.70@ .75**
West Ky. lump	Chicago	3.85	2.85	2.85	2.75@ 3.00
West Ky. mine run	Chicago	2.60	1.75	1.75	1.50@ 2.00
South and Southwest					
Big Seam lump	Birmingham	3.95	3.85	3.85	3.75@ 4.00
Big Seam mine run	Birmingham	2.35	1.95	1.95	1.75@ 2.15
Big Seam (washed)	Birmingham	2.60	2.35	2.35	2.25@ 2.50
S. E. Ky. lump	Chicago	6.10	3.25	3.25	*3.00@ 3.25*
S. E. Ky. mine run	Chicago	4.25	2.25	1.85	1.75@ 2.00
S. E. Ky. lump	Louisville	6.50	3.50	3.50	*3.00@ 3.75*
S. E. Ky. mine run	Louisville	3.40	1.85	1.85	*1.50@ 2.00*
S. E. Ky. screenings	Louisville	3.25	.75	.75	**.70@ .90**
S. E. Ky. lump	Cincinnati	6.50	3.25	2.60	*2.50@ 3.50*
S. E. Ky. mine run	Cincinnati	3.35	1.50	1.50	1.25@ 1.75
S. E. Ky. screenings	Cincinnati	3.00	.85	.85	*.30@ 1.00*
Kansas lump	Kansas City	5.00	5.10	5.10	5.00@ 5.25
Kansas mine run	Kansas City	3.50	3.50	3.25	3.00@ 3.50
Kansas screenings	Kansas City	2.50	2.00	2.00	2.00

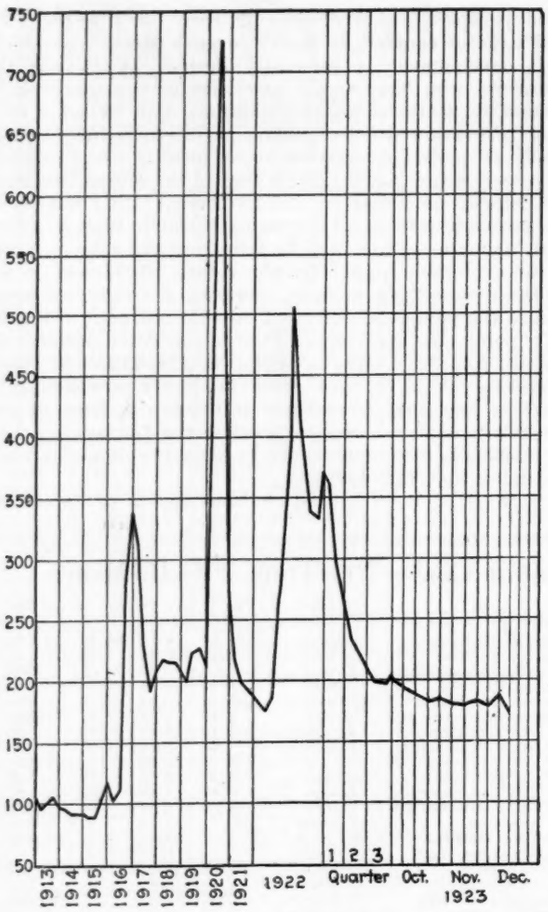
* Gross tons, f.o.b. vessel, Hampton Roads.

† Advances over previous week shown in **heavy type**, declines in *italics*.

Current Quotations—Spot Prices, Anthracite—Gross Tons, F.O.B. Mines

	Market Quoted	Freight Rates	Dec. 26, 1922 Independent	Dec. 26, 1922 Company	Nov. 26, 1923 Independent	Nov. 26, 1923 Company	Dec. 3, 1923† Independent	Dec. 3, 1923† Company
Broken	New York	$2.34	$9.00	$7.75@$8.25	$8.50@10.00	$8.00@$9.25	$8.50@10.00	$8.00@$9.25
Broken	Philadelphia	2.39	.....	7.90@ 8.10	.....	.....	.....	.....
Egg	New York	2.34	9.25@12.00	8.00@ 8.35	9.85@12.25	8.75@ 9.25	9.85@12.25	8.75@ 9.25
Egg	Philadelphia	2.39	9.25@11.00	8.10@ 8.35	9.85@12.20	8.75@ 9.25	9.85@12.20	8.75@ 9.25
Egg	Chicago*	5.06	12.50@13.00	7.20@ 8.25	9.60@12.50	8.00@ 8.35	9.60@12.50	8.00@ 8.35
Stove	New York	2.34	9.25@12.00	8.00@ 8.35	9.85@12.25	8.75@ 9.25	9.85@12.25	8.75@ 9.25
Stove	Philadelphia	2.39	9.25@11.00	8.15@ 8.35	9.85@12.20	8.90@ 9.25	9.85@12.20	8.90@ 9.25
Stove	Chicago*	5.06	12.50@13.00	7.35@ 8.25	9.60@12.50	8.00@ 8.35	9.60@12.50	8.00@ 8.35
Chestnut	New York	2.34	9.25@12.00	8.00@ 8.35	9.85@12.25	8.75@ 9.25	9.85@12.25	8.75@ 9.25
Chestnut	Philadelphia	2.39	9.25@11.00	8.15@ 8.35	9.85@12.20	8.90@ 9.25	9.85@12.20	8.90@ 9.25
Chestnut	Chicago*	5.06	12.50@13.00	7.35@ 8.35	9.60@12.50	8.00@ 8.35	9.60@12.50	8.00@ 8.35
Range	New York	2.34	.....	8.25	.....	9.00	.....	9.00
Pea	New York	2.22	7.00@11.00	6.15@ 6.30	6.40@ 7.75	6.15@ 6.65	*6.15@ 7.50*	6.15@ 6.65
Pea	Philadelphia	2.14	7.00@ 8.00	6.15@ 6.20	6.75@ 9.00	6.35@ 6.60	6.75@ 9.00	6.35@ 6.60
Pea	Chicago*	4.79	7.00@ 8.00	5.49@ 6.03	6.00@ 6.75	5.40@ 6.05	6.00@ 6.75	5.40@ 6.05
Buckwheat No. 1	New York	2.22	4.00@ 5.00	4.00@ 4.10	1.75@ 3.50	3.50	1.75@ 3.50	3.50
Buckwheat No. 1	Philadelphia	2.14	5.00	4.00	2.25@ 3.50	3.50	2.25@ 3.50	3.50
Rice	New York	2.22	3.00@ 3.25	2.75@ 3.00	1.25@ 2.50	2.50	1.25@ 2.50	2.50
Rice	Philadelphia	2.14	2.50@ 2.75	2.75@ 3.00	1.75@ 2.50	2.50	1.75@ 2.50	2.50
Barley	New York	2.22	1.75@ 2.00	1.50@ 2.00	.90@ 1.50	1.50	**1.00@ 1.50**	1.50
Barley	Philadelphia	2.14	1.00@ 1.75	2.00	1.00@ 1.50	1.50	1.00@ 1.50	1.50
Birdseye	New York	2.22	.....	2.10	1.25@ 1.45	1.60	.....	1.60

* Net tons, f.o.b. mines. † Advances over previous week shown in **heavy type**, declines in *italics*.



Coal Age Index of Spot Prices Bituminous Coal F.O.B. Mines

	1923			1922
	Dec. 3	Nov. 26	Nov. 19	Dec. 4
Index	181	186	183	326
Weighted average price	$2.19	$2.25	$2.21	$3.95

This diagram shows the relative, not the actual, prices on fourteen coals, representative of nearly 90 per cent of the bituminous output of the United States weighted first with respect to the proportions each of slack, prepared and run-of-mine normally, shipped, and second, with respect to the tonnage of each normally produced. The average thus obtained was compared with the average for the twelve months ended June, 1914, as 100, after the manner adopted in the report on "Prices of Coal and Coke, 1913, 1918," published by the Geological Survey and the War Industries Board.

around. Working time decreases little by little and there is nothing in December to hope for except a continuous run of blizzardy weather. Otherwise nothing much is expected of the market until Jan. 1. Railroad tonnage in most fields is light.

St. Louis Trade Is Quiet

Mild weather continues at St. Louis with a change of about 10 deg. in temperature. This has brought a little activity in retail trade in cheaper grades of coal. Country domestic is quiet and there is no call for country steam. Local wagonload steam shows a little improvement, but carload is at a standstill. Dealers report nothing doing in anthracite, smokeless or coke. With all yards loaded they are waiting for cold weather.

Kentucky Slumps Lower

From bad to worse appears to be the situation in Kentucky so far as demand is concerned. Reduction of general demand for prepared sizes is resulting in still fewer operating mines in west Kentucky, and this is making for slower production of screenings and a better price. Western Kentucky screenings have advanced to 70@75c. for pea and slack and 90c.@$1.10 for nut and slack, while prepared sizes have remained practically unchanged. Screenings have been sold down as low as 40c. within the past few weeks. However, mine run is selling at $1.50@$1.90 and a top of about $2, but is moving very slowly due to the oversupplied condition of the screenings market.

Jobbers are generally complaining over lack of demand for coal in quantity in any size, while operators bemoan time lost through lack of sales. The western field doesn't figure more than about 33⅓ per cent of capacity at this time, and the eastern no better than 50 per cent. The larger mines in some instances are producing a fair tonnage, but companies with several mines are making no effort to operate all their plants.

Northwest Is Full of Fuel

The movement of coal to Duluth took a new lease on life last week, when forty-eight cargoes arrived, of which five were anthracite. Twenty-six are reported on the way, in which are included four of hard coal, and it seems that at least twice that number of anthracite arrivals will be scored before the week is through.

Receipts of soft coal are large. In the event of a strike next spring there will be ample stocks on docks. Should the strike not materialize, there will undoubtedly be some hurried unloading. The industrial demand for soft coal is good but the commercial demand is flat. Public utilities, however, are suffering from lack of water power, and are forced to turn to coal.

The Milwaukee market remains quiet, but the weather is hardening slowly, and dealers are looking for real business soon. The market is glutted with all-rail Pocahontas, and mine run is down 50c. to $8 for steam and $9.50 for domestic use. Jobbers report the soft-coal market in general as dumpy, but as yet no shading in price other than in Pocahontas has developed. Cargoes continue to arrive by lake. The docks are full and some of the shipments will be held afloat. The total coal received at the port from all sources during the year promises to break all records.

Minneapolis, center of the war for Northwest markets between rail and Lake shippers, observes the docks stocking heavily preparatory to a strike or to a rate decrease sufficient to let them flood the country with Eastern coal. Hocking and Youghiogheny lump are now $6 and $6.50 with pile-run 75c. less on Hocking and 50c. less on Youghiogheny. Illinois and Kentucky shippers strive to maintain their circulars, but cannot in the face of the bitter competition between the various factions.

Western Trade Drones Along

Conditions are little changed throughout the Southwest and West in coal trading, in spite of snowstorms in Colorado, Nebraska and Kansas. These served to stimulate buying a little, both in Southwestern district coal and in fuel from Colorado. However, Kansas mines have not worked better than 60 per cent and there have been no changes in price. Nevertheless the ratio between working time and demand is such that "no bills" at least have not increased.

In Utah winter weather has created some retail business but the demand is easily supplied from small stocks on hand and buying has not been greatly increased. Low production of domestic sizes is pushing the price of slack up.

Price Readjustments in Ohio

Readjustment in the smokeless coal market continues at Cincinnati. Reduced prices for lump and mine-run were shown on the December circular, but New River operators and some brokers undersold these prices. Many of the mines in the Hazard, Harlan, Elkhorn, Big Sandy and southern West Virginia regions which closed early last week on account of the holiday remained closed the balance of the week. A surplus of coal together with unseasonable weather and light demand caused no change in the market. Retail prices receded with mine prices.

Scarcity of slack in the Cleveland market caused an advance in price, due in most part to the cut in production. Otherwise the market is dull and consumers are showing practically no interest. With lake shipments practically ended for this season receipts of bituminous coal at Cleveland increased, resulting in a surplus of coal. Notwith-

standing the present dullness, the trade is optimistic and expects heavier buying with the new year.

A slight increase in the demand for domestic coal was noticed at Columbus, due to colder weather, but it was easily met by the retail dealers, who are heavily stocked, as well as by consumers, who generally have their house bins filled. Pocahontas and splints are in good demand. The dullness extends to the steam-trade demand. Railroad demand is steady, while purchasing agents of large consumers and manufacturers are buying distress coal at low prices. Screenings are in slightly better demand. Many mines are closed and are not expected to reopen until demand is better.

The Pittsburgh coal market continues to show a better tone all around as compared with conditions a few weeks back, but last week there was no further improvement in prices, except in slack. A feature of the market is its failure to yield any on account of the ending of the lake season, when it is normal for prices to go off somewhat for December. Low prices had been reached some time ago, and operators seem to have made such careful provision against being caught with the necessity of selling any additional coal that, if anything, the market stiffened somewhat. Slack is expected to go up to the neighborhod of mine-run price. Steam slack is being quoted at $1.25@$1.30, with gas slack at $1.25@$1.35.

New England's Spurt Over

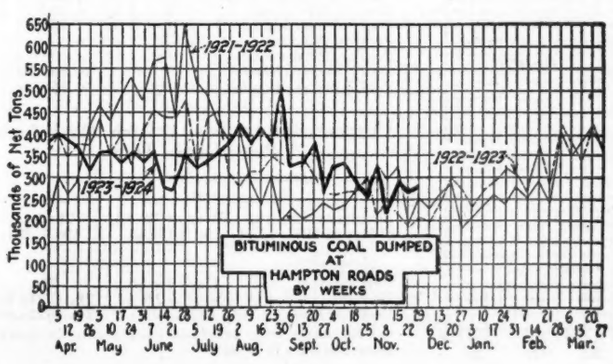
In New England the faint spurt of a week ago has about worn off. Labor troubles on the Virginian Ry. did not prove the hardening factor that shippers hoped, and $4.75 per gross ton f.o.b. Hampton Roads was the highest price quoted on No. 1 Navy Standard coals. A few sales have been made at $4.50, and it is probable that these will be duplicated soon unless something unforeseen occurs. Consumers show no greater interest in the spot market than at any time during the past sixty days, and at least one of the smokeless agencies announced a 25c. lower price on month-to-month contracts than during November.

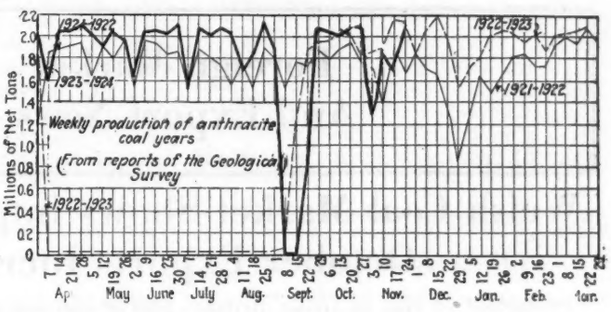
While distributors are asking $6 per gross ton on cars it is conceded that what few buyers there are can still cover at $5.25@$5.50. There has been nothing to improve inquiry for spot coal and the requirements of those who chose during November to buy at current prices for use early next spring have not been satisfied. There is no perceptible change in all-rail coal from central Pennsylvania. Only the output of non-union sections has any apparent opening even in the more western part of this territory, and quotations are freely made on fair grades roughly classified as Pool 10 at $1.50@$1.60 per net ton, f.o.b. mines.

There is a small volume of bituminous moving from Philadelphia and from New York, but practically all of this is on contract commitments and tends to diminish from week to week.

Consumers Ask About Contracts

A better feeling exists in the New York market for soft coal. Inquiries have increased and some consumers are asking about contracts from January to April next year, and others to cover the entire twelve months. The lack of distress coal was reflected in the opening of bids by the U. S. Shipping Board at New York for 2,300 gross tons of either Pool 9 or Pool 71 coal, the prices ranging from $4.80


Thousands of Net Tons
1921-1922
1922-1923
1923-1924
BITUMINOUS COAL DUMPED AT HAMPTON ROADS BY WEEKS
Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar.


Millions of Net Tons
1924-1925
1923-1924
1922-1923
1921-1922
Weekly production of anthracite coal years
(From reports of the Geological Survey
Ap. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar.

to $5.69 alongside, a substantial increase over previous offerings. While houses as a rule were not willing to quote prices on contracts for the first three months of next year the opinion was they would range as high as $3 for Pools 9 and 10. Consumers in Philadelphia are not willing to buy large tonnages, although producers try to impress upon them that the present prices are the lowest possible. Although movement remains in fair volume, shippers say business is as dull as at any time in the past four or five months. It is expected that iron plants will enter the market before the first of the year. Curtailed production following the close of lake shipments has tightened the supply of slack.

Demand at Baltimore for gas and steam coals is running below normal. Lack of demand has affected the smokeless coal market in West Virginia, as well as prices. Wage readjustments in some instances have permitted a resumption of operations in the Upper Potomac and Georges Creek regions. At Birmingham there is considerable dullness and conditions are unsatisfactory. Spot coal is in light demand and mines without contracts are finding it difficult to maintain a short working schedule. The bunkering trade is hard hit by oil competition.

Cancellations for Anthracite Received

Stove and chestnut sizes of hard coal are becoming more plentiful in the East, due to the practical stopping of Lake shipments, causing producers to distribute their coal in other directions. Egg and pea coals together with the steam sizes are available to all buyers. Some cancellations of orders for high-priced coal have been received by wholesale dealers, but so far they have not been in large volume. Like New York, Philadelphia has received better shipments of all sizes, and while they have not been large the demand for chestnut coal is easier. In the absence of cold weather there is no rush for coal. The immediate demand of consumers of hard coal at Baltimore is being taken care of by the increased arrivals. There is a heavy demand for anthracite in Toronto, but with arrivals fairly regular, dealers believe they will be able to supply all requirements. Shipments of hard coal to New England and eastern New York by rail during the week ended Nov. 24, the American Railway Association reports, were 3,646 cars, as compared with 3,455 cars the previous week. During the week ended Nov. 25, according to the Geological Survey reports, 171,975 net tons of hard coal were shipped from Lake Erie ports, making the shipments for the season to date 3,368,287 tons.

Production of beehive coke showed an increase of 6,000 net tons during the week ended Nov. 24 when compared with the previous week, the Geological Survey reports showing an estimated production of 260,000 tons, as compared with 254,000 tons during the week ended Nov. 17. The cumulative production during 1923 to Nov. 24 stood at 16,695,000 net tons.

Car Loadings, Surplusages and Shortages

	Cars Loaded	
	All Cars	Coal Cars
Week ended Nov. 17, 1923	991,745	170,875
Previous week	1,036,067	190,282
Same week in 1922	957,564	200,791

	Surplus Cars		Car Shortage	
	All Cars	Coal Cars		
Nov. 22, 1923	111,797	58,490	1,866	907
Same date in 1922	5,306	2,274	.....	.....
Nov. 14, 1923	71,119	31,850	3,901	1,169

Foreign Market And Export News

Welsh Coal Market Shows Improvement; October Exports Increase

Production of coal in Great Britain gained 2,000 tons during the week ended Nov. 17, a cable to *Coal Age* stating that 5,574,000 tons were produced. The previous week's output was 5,572,000 tons.

There has been an improvement in the Welsh market. After a series of delays, tonnage is moving more freely. Shipments are increasing and mine suspensions are less frequent. The tonnage position, however, is not satisfactory owing to the diversion of steamers to the Far East, and also to the Black Sea.

Exporters who sold on c.i.f. terms based upon the freights ruling some weeks ago are in some cases faced with losses instead of profits. Some mines are fairly busy, while others continue to have heavy stocks of coal on hand, and find it necessary to make concessions to buyers to get quick movement. On the whole, the operators are well booked until the middle of January and with the approach of Christmas anticipate growing pressure.

Contract business for 1924 is under negotiation though some consumers on the Continent are inclined to buy on the open market rather than place new contracts at prices above those now in force.

The Newcastle market remains steady but quiet. Most of the mines have sold their output for the rest of the year. There is some easiness for prompt shipment, partly owing to bad weather and delayed arrivals of shipping, but mainly as a result of the difficulty which German buyers are finding in obtaining credits for coal due to be shipped.

French Coal Imports and Exports

There were produced by the French mines, excluding Sarre, during September 3,321,297 metric tons of coal and lignite; 181,648 tons of coke, the independent mines not included; and 264,787 tons of briquets, as compared with 3,405,028 tons of coal and lignite; 180,860 tons of coke, and 263,164 tons of briquets in August. During the same period France imported 2,619,831 tons of coal and lignite, 280,316 tons of coke and 46,374 tons of briquets, while the importations in August were 2,241,157 tons of coal and lignite 274,606 tons of coke and 64,460 tons of briquets.

Exports in September were 156,137 tons of coal, as compared with 187,725 tons in August; 50,944 tons of coke as against 59,976 tons, and 19,536 tons of briquets as compared with 12,545 tons.

Hampton Roads Prices Stronger

Market conditions at Hampton Roads last week continued dull, except that prices showed a little more strength. Despite the strike on the Virginian Ry. a fair volume of coal continued to arrive at Sewall's Point.

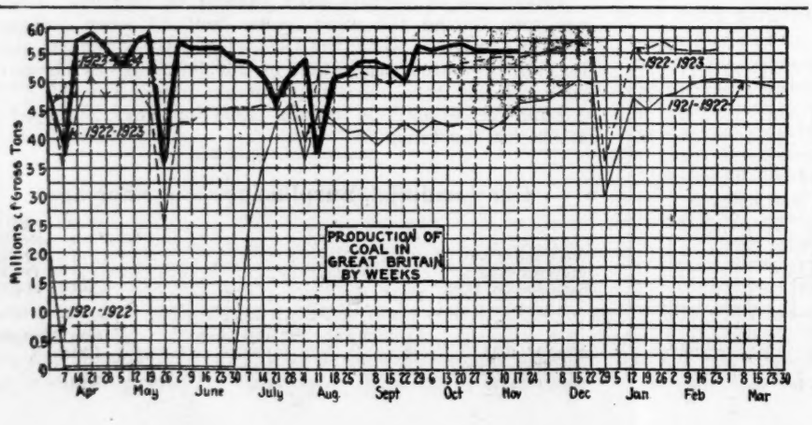
Coastwise business was fair with bunkers holding their own. Foreign movement was slow, while the prospects were not bright.

The tone of the market was generally dull, and business was at a lower ebb than is usual at this time of the year. Domestic trade was promising and the prospects for an increase in coastwise movement during December was bright.

Coal and Coke Exports and Imports

During October 400,599 gross tons of anthracite and 1,488,887 tons of bituminous coal were exported from the United States, as compared with 404,999 tons of anthracite and 1,729,425 tons of bituminous coal in the corresponding month of last year. Of the total Canada received 1,247,952 tons, Italy 59,068 tons, France 27,045 tons and Cuba 52,680 tons. There was 77,737 tons of coke exported as compared with 38,613 tons in October of last year.

During the same month the United States imported 40,213 tons of anthracite and 89,059 tons of bituminous coal of which 57,026 tons was dutiable. During the corresponding month of last year there was imported 105,501 tons of anthracite and 1,143,157 tons of bituminous coal. Of the imports last October the United Kingdom furnished 10,277 tons, Canada 57,026 tons, and Australia 15,334 tons. Imports of coke amounted to 3,815 tons, as compared with 22,880 tons in October of last year.



French Coal Prices Advance

After a strike which continued a few days the workers in the French coal mines were granted increases ranging from 1 fr. to 3 fr. in all Basins, and up to 5 fr. in Lorraine. It is expected that due to the advances in wages the selling prices of coal will advance from 3 fr. to 5 fr. per ton.

Deliveries of coal from the various mining fields are satisfactory, and British exports are normal. Due to decreased activity at the plants demand for industrial coals is slower. Announcement was made that contracts aggregating about 200,000 tons of coal have been placed with American houses.

Export Clearances, Week Ended Dec. 1, 1923

	Tons
FROM BALTIMORE	
For Canada:	
Dan. SS. Nordkap	5,389
COKE	
For Chile:	
Jap. SS. Belgium Maru	4,050
FROM HAMPTON ROADS	
For Red Sea:	
Br. SS. City of Auckland, for Perim	2,519
For West Indies:	
Swed. SS. Adolf, for Kingston	2,507
Amer. Schr. Dorothy, for St. Stephens	1,117
Swed. SS. Finn, for Port of Spain	2,477
For Peru:	
Peru SS. Apurimac, for Callao	2,798
For Newfoundland:	
Nor. SS. Anna Sofie, for St. Johns	4,775
FROM PHILADELPHIA	
For Cuba:	
Nor. SS. Bay California, for Havana	...

Hampton Roads Pier Activities

	Nov. 22	Nov. 28
N. & W. piers, Lamberts Pt.:		
Cars on hand	1,899	1,706
Tons on hand	113,069	100,682
Tons dumped for week	119,592	116,322
Tonnage waiting	10,000	9,250
Virginian Ry. piers, Sewalls Pt.:		
Cars on hand	1,051	667
Tons on hand	64,450	41,550
Tons dumped for week	26,327	40,422
Tonnage waiting	.....	2,300
C. & O. piers, Newport News:		
Cars on hand	1,629	1,217
Tons on hand	81,335	67,290
Tons dumped for week	90,065	100,907
Tonnage waiting	9,510	17,152

Pier and Bunker Prices, Gross Tons

	Nov. 24	Dec. 1†
PIERS		
Pool 9, New York	$4.75@$5.25	**$4.90@$5.25**
Pool 10, New York	4.50@ 5.00	**4.75@ 5.00**
Pool 11, New York	4.40@ 4.75	**4.40@ 4.75**
Pool 9, Philadelphia	4.85@ 5.10	**4.85@ 5.10**
Pool 10, Philadelphia	4.00@ 4.65	**4.00@ 4.65**
Pool 11, Philadelphia	3.95@ 4.00	**3.95@ 4.00**
Pool 1, Hamp. Roads	4.50	**4.50@ 4.60**
Pools 5-6-7 Hamp. Rds.	4.15@ 4.35	**4.15@ 4.35**
Pool 2, Hamp. Roads	4.15@ 4.25	**4.25@ 4.35**
BUNKERS		
Pool 9, New York	5.05@ 5.55	**5.20@ 5.55**
Pool 10, New York	4.80@ 5.30	**5.05@ 5.30**
Pool 11, New York	4.70@ 5.05	**4.70@ 5.05**
Pool 9, Philadelphia	5.10@ 5.50	**5.10@ 5.50**
Pool 10, Philadelphia	4.65@ 5.00	**4.65@ 5.00**
Pool 11, Philadelphia	4.30@ 4.55	**4.30@ 4.55**
Pool 1, Hamp. Roads	4.50	**4.50@ 4.60**
Pool 2, Hamp. Roads	4.15@ 4.25	**4.25@ 4.35**

Current Quotations British Coal f.o.b. Port, Gross Tons

Quotations, by Cable to *Coal Age*

	Nov. 24	Dec. 1†
Admiralty, large	27s.6d.@28s.6d.	**28s.6d.**
Steam smalls	18s.@19s.6d.	**19s.@20s.**
Newcastle:		
Best steams	25s.@26s.6d.	**26s.**
Best gas	23s.6d.@24s.6d.	**24s.@24s.6d.**
Best bunkers	24s.6d.	**24s.@25s.6d.**

† Advances over previous week shown in **heavy type**, declines in *italics*.

Traffic News

Advises That I. C. C. Modify Report on Car Distribution

In a tentative opinion by Examiner David T. Copenhafer in the case of the Northern West Virginia Coal Operators' Association versus the Director General of Railroads, the examiner finds that the Interstate Commerce Commission should modify its previous report. The practices of the Director General during 1919 and 1920 in the distribution of coal cars as between mines on the Monongahela and Morgantown & Wheeling railways and the mines on the Pittsburgh & Lake Erie, south of Pittsburgh, and on the Monongahela Division, southwest branch, and the Pittsburgh West End Division of the Pennsylvania R.R., says the examiner, subjected operators of coal mines on the first two named roads to undue prejudice and disadvantage to the extent that the percentage of cars furnished the mines on the latter roads in each instance was less than the percentage of cars the mines as a whole on all lines under consideration would have received had all the system cars placed for coal loading on those lines been distributed equally.

In its original report there was no basis for findings as to the extent of damages. For that reason the case was held open for further hearing. It has developed that the figures upon which the commission's findings were based included numerous privately owned cars, which should not have been included in the distribution.

"The complainant's mines," says the tentative opinion, "were entitled only to such car supply as they would have received had the available cars been distributed equally. With an equal distribution, the mines on all lines here considered would have received 87 per cent and 58.7 per cent respectively, of their orders during the periods July, 1919, to October, 1919, and December, 1919, to February, 1920, inclusive, or 74.3 per cent for the entire period."

Ruling Issued on Indiana Rates

In the complaint of the Indiana State Chamber of Commerce against the Baltimore & Ohio and fifty-three other railroads the Interstate Commerce Commission made a ruling in a decision dated Oct. 31 in which it orders the defendants according as they participate in the transportation "to establisn, on or before Feb. 18, 1924, upon notice to this commission and to the general public by not less than 30 days' filing and posting in the manner prescribed in section 6 to the Interstate Commerce Act, and thereafter to maintain and apply to the transportation of coal, in carloads, from mines in the State of Ohio and the Inner Crescent district of Pennsylvania, Maryland, West Virginia, Tennessee, Virginia and Kentucky to points in the Muncie group, rates which shall not exceed those contemporaneously in effect to Fort Wayne, Ind.; to points in the Peru group, rates which shall not exceed those contemporaneously in effect to Fort Wayne and Muncie and points taking the same rates by more than 5c. per net ton; and to points in the Elkhart group rates which shall not exceed those contemporaneously in effect to the Fort Wayne group by not more than 20c. per net ton."

Indiana industries, coal operators and miners, through representatives in the Indiana State Chamber of Commerce, the Indiana Bituminous Coal Operators' Association and district 11, United Mine Workers, recently argued before the Indiana Public Service Commission that Indiana intrastate coal freight rates on hauls exceeding 30 miles are too high and that the commission's tentative order does not reduce them enough. Railroads hold that the Indiana rates are not out of line.

Record Coal Shipments to Lakes

Up to Nov. 27, according to reports filed with the car service division of the American Railway Association, 30,618,000 tons of coal have been dumped at Lake Erie ports for shipment since Jan. 1 this year, of which 29,036,000 tons were cargo coal and 582,000 tons bunker fuel. This is a larger tonnage than has ever been dumped previously.

By the time the navigation season closes it is estimated that a total of 31,313,000 tons will have been dumped, of which 29,700,000 will be cargo coal and 1,613,000 tons bunker coal. The best previous record was made in 1918, when 29,388,242 tons of both cargo and bunker coal was transported by the railroads and dumped at Lake Erie ports during the entire season.

May Acquire Scotts Run Ry.

The Monongahela Railway Co. is making arrangements to take over the Scotts Run Ry., formerly the Morgantown & Wheeling. Permission has been sought from the Interstate Commerce Commission to make such financial arrangement as the issue of one million dollars in common stock of the Scott's Run Company, which the Monongahela will buy at par. It is understood the new management will make improvements necessary to enlarge the coal-carrying capacity of this road.

Plan New Road in Indiana County

Extensive coal deposits in Indiana County, Pennsylvania, would be opened for development if a new railroad, to be known as the "Conemaugh & Blacklick," is built. Application for a certificate of public convenience has been filed. The proposed line would connect the New York Central at Nant-y-Glo of Heilwood with Johnstown.

Challenges Central Rates in Ohio

Rates of the New York Central Lines on coal shipped from mines on the T. & O. C. division of that system to the Fairfield Paper Co., at Baltimore, Ohio, have been challenged in a complaint filed with the Ohio Utilities Commission.

Association Activities

The Board of Directors and Executive Committee of the **National Retail Coal Merchant's Association** will meet at Hotel Shoreham, Washington, D. C., Friday and Saturday, Dec. 14 and 15.

The Smokeless Coal Operators' Association of West Virginia will hold its annual meeting at Washington Hotel, Washington, D. C., on Dec. 13. The principal business will be the election of a Board of Directors to be followed by the election of officers. The meeting will be followed by a luncheon at which United States Senator David A. Reed, of Pennsylvania, will make an address.

The Wholesale Coal Club is the newest coal organization in Indianapolis, composed, as the name would signify, of the leading wholesalers of the city. The organization meets once a month, the principal purpose being to get better acquainted, according to Arch V. Grossman, president. H. B. Glover, with the Knox County Consolidated, is the vice-chairman, and Ray Mulvihill, secretary of the Cedar Creek Coal Co., is the secretary.

About 500,000 copies of a digest of the report of the U. S. Coal Commission on retailing coal will be distributed by the **National Retail Coal Merchants Association** as part of a campaign planned by the association to inform the consuming public regarding the fuel situation. At the same time the association will undertake a campaign to enlarge its membership. Officials of the association are highly pleased with the report of the Coal Commission on the retailers. In the words of Joseph E. O'Toole, resident vice-president, "The Coal Commission gave the retailers a clean bill of health, and we want the public to know of it."

Coming Meetings

Coal Mining Institute of America will hold its annual meeting Dec. 19, 20 and 21 at Pittsburgh, Pa. Secretary, H. D. Mason, Jr., Chamber of Commerce Building, Pittsburgh, Pa.

Tug River Coal Operators' Association. Annual meeting Jan. 4, 1924, Bluefield, W. Va. Secretary, C. C. Morfit, Welch, W. Va.

New England Wholesale Coal Association. Annual meeting Jan. 8, 1924, Boston, Mass. Secretary, R. S. Townsend, Boston, Mass.

Engineers' Society of Western Pennsylvania. Annual meeting Jan. 15, 1924, Blue Room, William Penn Hotel, Pittsburgh, Pa. Secretary, K. F. Treschow, Pittsburgh, Pa.

American Wood Preservers' Association. Annual meeting Jan. 15-17, 1924, Hotel Buehlebach, Kansas City, Mo. Secretary, P. R. Hicks, Chicago, Ill.

Northeast Kentucky Coal Association. Annual meeting Jan. 24, 1924, Ashland, Ky. Secretary, C. J. Neekamp, Ashland, Ky.

Obituary

T. L. Sharpe, aged 69 years, died in Montgomery, Ala., Nov. 21, Mr. Sharpe, together with Wm. Cook, Sr. operated the Black Creek Coal Co., at Nauvoo, Walker County, Ala., and also was interested in mining operations in Kentucky. He had been long identified with mining operations in the Alabama field and was widely known. Interment took place at Demopolis, Ala., his birthplace.

News Items From Field and Trade

ALABAMA

The Paramount Coal Co. is making two openings near Helena, Shelby County, where the company now has one mine in operation. The openings are on property comprising about 250 acres leased from the Tennessee Coal, Iron & Railroad Co. T. S. Abernathy is president and J. M. Donaldson, vice-president and general manager of the Paramount company.

General Wm. L. Sibert, well-known army officer and native Alabaman, has been **appointed president of the State docks commission,** vice Gordon Crawford, resigned. General Sibert will supervise the building of docks and terminals at Mobile, to which work the state will lend its aid to the extent of $10,000,000. The salary of General Sibert has been fixed at $10,000 per year.

COLORADO

A large natural gas gusher was struck near Fort Collins, in the center of the northern Colorado lignite fields recently. This well is one of the largest of its kind in that section, producing approximately 82,000,000 cu.ft. of natural gas per day. It is expected that the Colorado Public Service Company will take this well over and pipe this gas into Denver and surrounding vicinity.

The Boulder Coal Mining Co. has been incorporated in Boulder, Colo., with a capital of $100,000, by H. Bennett, T. Tisone, J. Bertotti, H. H. Parker and R. Moschetti.

CONNECTICUT

In a report sent to Governor Templeton, by the Hartford Chamber of Commerce, **Governor Pinchot, of Pennsylvania, is held in part to be responsible** for the high price of anthracite. The blame, according to the report, is shared also by the middlemen and operators. The findings are the result of a survey made by the chamber upon request of the Governor. The report says there is nothing that Connecticut, through its Legislature or Governor, can do to alter conditions. The remedy, it says, lies primarily with Pennsylvania, which has a monopoly of the anthracite supply of the country.

ILLINOIS

The recent closing of the two mines near Carlinville, of the Standard Oil Co. presents an interesting phase of coal operation. These mines are models of economy. They worked regularly and yet other mines sold the Standard Oil Co. coal for their refineries below the cost of their own. The only reason for this is that "the rest of the tonnage" which goes to the public is expected to carry the loss sustained on the tonnage shipped to the Standard Oil Co. The Standard mines are down indefinitely.

The Cripple Creek Coal Co. of Galesburg, has leased 1,200 acres of land east of that city and a new shaft will be sunk in the spring.

Due to its ability to buy coal cheaper than it can be produced **the Standard Coal Co. has closed two of its mines,** one located at Schoper and the other at Berry, throwing approximately 1,000 men out of employment. Officials of the company have declared for some time that coal could be purchased cheaper in the market than it can be mined.

The Wabash R.R. and the Consolidated Coal Co. of St. Louis are still acquiring coal rights to the north, east and south of Taylorville. In the last two weeks of November they added one thousand acres to their holdings. The two now have their coal rights in solid bodies and it is expected that they will both begin mining coal within the next season. The Wabash has 30.000 acres and the Consolidated 20,000, involving a total expenditure of more than $1,000,000.

The Bissell Coal Co. has **changed its name to the Utilities Coal Corporation, Inc.,** with offices at 810 Ferguson Building, Springfield.

The Burlington Ry. has announced plans for the new freight yards at Willows to cost $700,000. These yards will have a capacity of 1,000 cars and will be used to facilitate coal shipments. Ninety acres will be taken over for the yards.

Fire on Dec. 1 destroyed the old tipple and coal washer of the **Taylor Coal Co.** at Herrin.

INDIANA

A stockholders' report of an Indiana coal mine proves that **not all coal mines are fizzles even in these trying times.** This mine has a capital of $300,000. The earnings from Nov. 1, 1922, to Oct. 30, 1923, were $240,000. This mine does not sell its own coal. It is handled through jobbers.

Among the reasons why Indiana mines are 40 per cent shut down and why the other 60 per cent work only half the time, William Mitch, secretary of District II of the United Mine Workers, recently said publicly "there appear to be too many mines and too many miners." John Hessler, district president, said a freight-rate adjustment to give Indiana coal a better chance in competitive markets would help.

Regulations of the State Board of Mines and Mining governing enforcement of mining laws in wagon mines are discussed in an opinion submitted to Cairy Littlejohn, state mine inspector, by Attorney General U. S. Lesh. Under the law, mines employing more than ten men are subject to certain regulations of the board. Mr. Lesh said the fact that fewer than ten men are employed in a mine during part of a year would not protect the owner from prosecution for any violations occurring at the time when the number of employees exceeded ten.

Among the **mines which have recently joined the popular custom of closing down** are Big Creek Coals, Inc., No. 6, at Grayson; Franco No. 2, at Paulton, and the mine of the Orchard Coal Co., at Marion. The shutdowns are the result of lack of orders and indefinite in length.

KENTUCKY

A total of $1,050,000 has been allotted by the War Department for use in continuing the **river channel development work in the Louisville district** of the Ohio River, and an additional $950,000 for the Cincinnati district, mostly for lock and dam work.

Barbourville interests have leased a mine at Anchor belonging to the Consolidation Coal Co.

MASSACHUSETTS

Fuel Administrator Hultman in a recent statement says that **seventy communities in Massachusetts have received less than 25 per cent of their normal hard-coal requirements** to date and calls on shippers to end an apparent discrimination which is assisting unscrupulous speculators to gouge consumers in that state. Mr. Hultman declares that most of the communities listed are small and their situation "gives strength to the claim that small communities and small dealers are being discriminated against."

MISSOURI

The October grand jury, of which W. K. Kavanaugh was foreman, finished its report at St. Louis on the last of November, recommending that the City of St. Louis use a proper standardized form of coal contract on account of some alleged irregularities in the deliveries of coal in 1922. The jury heard a number of witnesses pertaining to 90,000 tons of 2-in. screenings contracted for, but on which, it is claimed, a large tonnage of screenings as low as ¾ in. was shipped. This coal was for the Water Department. An investigation of the books, etc., did not justify indictments, but the jury strongly urged a rearrangement of contract forms.

MONTANA

Work was resumed at the Gilbert-Crawford operation, near Roundup, last March. The mine is electrically equipped throughout. Efforts for the present will be confined to development work, the running of the main entry and the opening of two entries on the east and two on the west side.

NEW YORK

Lucius W. Robinson, chairman of the Rochester & Pittsburgh Coal & Iron Co., announces the appointment of **J. Noble Snider,** at present coal traffic manager of the New York Central Railroad Co., as **vice president in charge of sales,** with offices at No. 1 Broadway, New York City. At the same time Mr. Snider announced the appointment of J. M. Nelson as sales agent at Buffalo; J. N. Terrio as sales agent at New York and Charles C. Schaefer as sales agent at Rochester. All appointments became effective Dec. 1.

Alex Bonnyman, chairman of the board of the various Blue Diamond Coal Mining properties, arrived in New York recently after a three months' visit to Scotland and Naples. He was welcomed home by his brother, James Bonnyman, head of the Blue Diamond Coal Sales Co. and formerly a large operator at Birmingham, Ala.

OHIO

The Atwood Coal Co., of Wooster, has been chartered with a capital of $50,000 to mine coal and deal in coal and kindred products, both wholesale and retail. Incorporators: C. Otis Smith, Francis Zarlingo, Mabel C. Smith, F. M. Vanover and T. E. Steiner.

The operating offices of the **Hocking Valley Products Co.,** large coal operators in the Hocking Valley, have been moved from Columbus to Logan. The sales end of the business has been taken over by the Jay Miller Coal Co.

Robert Farmer, vice-president of the United Mine Workers of Sub-District 5, has resigned, effective Nov. 15. The resignation came as a surprise to the miners in eastern Ohio. The understanding is that Farmer has been offered executive positions at the mines of several of the larger companies operating in the field.

H. C. Howland, formerly with the Packard Coal Mining Co., of Columbus, has been made manager of sales of the Wheeler Coal & Coke Co., of Columbus. **W. C. McClanahan,** formerly with the Kanawha Valley Coal Co., of Charleston, W. Va., has been employed as a salesman for the Wheeler Coal & Coke Co.

The Maple Grove Coal Co., of Columbus, chartered about six months ago, has just about completed its tipple at a new mine in Harrison County on the Wheeling & Lake Erie R.R., which will be placed in operation soon. The initial production will be about 300 tons daily, which will be gradually increased.

The State Industrial Commission, which has charge of mine activities, has started a **campaign to prevent injuries to miners** employed in all mining districts of the Buckeye State. The campaign will be largely educational and will be pushed in 33 counties where mining activities are carried on. Jerome Watson, chief of the Bureau of Mines, has interceded with federal authorities to have a federal mine-rescue car sent into the state to be used jointly by Ohio and Kentucky, which will move from point to point showing first-aid measures and safety plans of the federal and state bureaus.

PENNSYLVANIA

R. B. Mellon, of Pittsburgh, president of the Mellon National Bank and a director of the Union Trust Co., has been **elected chairman of the Board of Directors of the Pittsburgh Coal Co.,** which office was made vacant several months ago by the death of M. H. Taylor. Mr. Mellon was elected to the board of directors to succeed his brother, A. W. Mellon, when he was appointed Secretary of the Treasury in President Harding's Cabinet.

The Marion Machine, Foundry & Supply Co., of Scottdale, has just completed a domestic coke preparation plant for the Mahoning Coal Co. at Alverton, near Scottdale. The capacity of the plant is about 300 tons per day.

John Callahan, formerly traffic manager of the National Coal Association and until recently associated with the Morrow-Callahan Coal Co., of Cincinnati, has become sales manager for the Keystone Coal Catalogue and Mining Directory, published by the Keystone Consolidated Publishing Co., of Pittsburgh.

An important coal land deal has been closed in Cambria County in which **John H. Weaver,** of Philadelphia, head of the Nant-Y-Glo Coal Mining Co. and the Monroe Coal Co., **becomes the owner of 992 acres of valuable coal land,** purchased from T. Stanton Davis, of Ebensburg. The consideration is said to be $193,280. The deal affects only individual holdings of Mr. Davis and is not connected in any way with the Navy Smokeless Coal Co.'s holdings in the same vicinity. Two tracts are involved, one containing 736 acres and the other 256 acres. The smaller tract brought $80 per acre while the larger tract brought $200 per acre. The entire plot lies in Cambria township.

The Hillman Coal & Coke Co. has closed down its Pike mine, near Brownsville, for an indefinite period, and has resumed operations at the Jerome No. 2 mine in the Somerset County smokeless coal field, which has been idle for a couple months past. The Pike mine is in the Pittsburgh seam in Fayette County.

The anthracite companies of Pennsylvania **are satisfied with the system of assessing the price of coal at the mines for state tax purposes,** Auditor General Samuel S. Lewis said in reply to criticism of the Anthracite Bureau of Information and Samuel D. Warriner, who said that the state places a value on coal in excess of the price obtained for the coal. "The settlement of the anthracite coal tax is no different from the settlement of taxes on capital stock, loans and gross receipts," said the Auditor General. "At times the valuations are accepted by the fiscal officers and then again there are differences that are adjusted after hearing. I know of no differences with any of the coal companies. They have told me they are satisfied. The cards are all laid on the table and the public has been advised regarding all matters connected with the tax collection."

WASHINGTON

The Lisco Coal Co.'s property at Renton Junction has been **completely unionized** by agreement signed late in November. It is a small mine.

Chain Belt Co., Milwaukee, Wis., manufacturers of Rex chain, transmission machinery and conveying equipment, formerly represented on the Pacific Coast by Meese & Gootfried Co., San Francisco, **has established direct factory branches and warehouses in Portland and Seattle.** Arrangements also have been made with the Washington Machinery Depot, Tacoma, to carry a large stock of Rex chain and transmission machinery.

WEST VIRGINIA

J. M. Scott, general manager of the B. & O. Ry. stated on Nov. 24 that **32,000,000 tons of coal have been shipped over the Baltimore & Ohio from West Virginia to the Great Lakes this year.** This is the greatest tonnage, he said, that has ever been shipped from the coal fields of the Little Mountain state to the lake region.

The R. M. Davis Coal Co., **entertained many coal and railroad representatives** including transportation and traffic managers of the Baltimore & Ohio, Pennsylvania, the Western Maryland, the Monongahela, Long Island, New York Central and Pittsburgh and Lake Erie railroads at Morgantown, recently. Speakers included Dr. I. C. White, state geologist of West Virginia; former Governor W. E. Glasscock, and Thomas K. Maher, of Cleveland, Ohio.

The Laurel Run Coal Co., of Fairmont, has just been organized with a capital stock of $20,000 with a view to operating in the Fairmont region. Fairmont is to be the headquarters of the company, which was organized by Thomas H. Laulis and James Laulis, of Shinnston; T. F. McIntire, Charles E. Potter and E. C. Frame, of Fairmont.

Harry B. Martin, of the Greenmar Coal Co., of Elkins, has been elected as a director of the newly organized Citizens National Bank, of Elkins.

The West Virginia Supreme Court has held in the **case of Wells Goodykoontz** and others against the White State Mining Co. that unless otherwise provided, there is an implied covenant in every lease of land for coal and coking purposes; that the lessee will do nothing and leave nothing undone reasonably necessary to protect the inheritance against waste and destruction resulting from his operation on the land; that unless waived by the terms of the contract of lease, the lessor of land for coal and coking purposes has the right to subjacent support for all superincumbent strata of coal and may enjoin removal by the lessee of the mine props or pillars in the subjacent strata until the mineable and merchantable coal in the upper seams has been mined out by the lessee, or by the lessor after the term of the lease has expired; that if under such a lease the lessee has opened a mine in one or more of the mineable seams and has, in violation of his duty, neglected to protect the inheritance, which has resulted in the destruction of any part of the coal unmined, equity will require him to account to the lessor for the damages so sustained by him to the inheritance.

There were thirty-two fatalities in the West Virginia mines in October, all but twelve of which resulted from falling roof and coal. Of the remaining twelve deaths in and about the mines, five were due to mine-car accidents. One man was killed in a motor accident, one in a mining-machine accident and two by electrical shock. Outside the mines, one miner was killed in an accident on an incline and one in an accident in connection with the operation of an electric hoist. Seven of the thirty-two fatal accidents occurred in McDowell County, Logan County coming next with six, and Mingo with four. In Monongalia County there were three fatalities and in the counties of Brooke, Fayette, Kanawha, Marshall and Raleigh two each. In the counties of Clay, and Ohio there was one fatality each.

WISCONSIN

The Carnegie and Great Lakes docks, located at Superior, **have protested to the Superior City Council against the tax on railroad coals** on their docks. They claim that railroad coal should not be considered in the same category as commercial coals. The docks threaten to change their port for storage of railroad coal unless the tax is dropped.

WASHINGTON, D. C.

Dr. Thomas T. Read, supervising mining engineer of the Bureau of Mines, has been **awarded a gold medal** and a commemoration diploma by the government of Brazil. Dr. Read was the representative of the Department of the Interior with the United States Commission to the celebration of the 100th anniversary of the independence of Brazil at Rio de Janeiro last year, and also was the special delegate of the American Institute of Mining and Metallurgical Engineers and the Federated American Engineering Societies to the International Engineering Congress held in connection with the celebration.

Representative Crampton, of Michigan, chairman of the subcommittee on appropriations for the Interior Department, spent a week recently at the Pittsburgh station of the Bureau of Mines. So that he may be fully acquainted with the activities of the Interior Department, Mr. Crampton has spent a large portion of the interim between Congresses in familiarizing himself with the field work and experiment station work of the various bureaus.

The Bureau of Mines has offered through the Washington University, of St. Louis., **two scholarships in mineral economics** to mining engineering graduates who have completed some work in economics. These scholarships, valued at $1,500 yearly, will enable the holders to study for two years at the graduate school of Washington University in Washington, D. C., for a Ph.D. degree in economics. The students will work under the technical guidance of Bureau of Mines engineers.

George S. McCaa, engineer in charge of the Mine Safety Service of the Bureau of Mines, has resigned to enter private employment. Mr. McCaa, who is recognized as one of the foremost research men specializing on oxygen breathing apparatus, developed the half-hour type breathing apparatus for the Navy.

Following its custom of rotating its chairmanship among the Commissioners each year, **Commissioner Huston Thompson on Dec. 1 became chairman of the Federal Trade Commission,** to serve one year, succeeding Victor Murdock, who has been chairman for the past year.

CANADA

Roy M. Wolvin, president of the **British Empire Steel Corporation, has announced the adoption of a pension system** for retired employees. It is applicable to all male employees both of the steel and coal departments who have served twenty-five years and have reached the age of sixty-five, and to females who have served the same term and reached the age of fifty-five years, and to any employee who has been fifteen years in the service and in the course of his employment has become permanently incapacitated for further work.

Sir Henry Thornton, head of the Canadian National Railways, stated in Toronto recently that **no more cut rates would be offered by the road on Alberta coal** for Ontario. The last word has been said in regard to the matter, he said.

A report issued by the Dominion Bureau of Statistics on the coal industry in 1921 states that on Dec. 31 of that year there were **402 coal mines in Canada** having an area of 713,434 acres, and 1,433,331 sq.ft. of underground workings. There were 168 stock companies operating 221 mines. The total par value of issued securities was $138,986,473, of which $86,727,930 was held in Canada; $25,879,964 in the United States; $18,721,941 in Great Britain and $7,656,638 elsewhere. Capital employed in coal mines at Dec. 15, 1922, was placed at $140,466,108.

William Sloan, minister of mines, has given notice of **two bills that he purposes introducing** at the meeting of the Provincial Legislature, now in session. The first is an amendment to the Mines Act, imposing greater penalties for infractions of the act. Thus, for example, the penalty for carrying matches and smoking materials underground will be increased from $10 to $100. The other bill, the imposition of a tax of 1c. per gallon on fuel oil entering British Columbia from foreign countries, is meeting with a storm of opposition by oil-burning industries. The tax is being imposed with a view to protecting the coal-mining industry of Vancouver Island against the competition of California and Mexican fuel oil.

Under the provisions of **"An act to regulate the sale of coal"** the Lieutenant Governor of the Province of Alberta has ordered that every operator in Alberta shall have a registered name for his coal, all coal shipped and sold by the operator shall be under such registered name; that every invoice and shipping bill and a card which shall be displayed on the car door shall state the name of the mine, district whence it is shipped, name and size of the coal and the date of shipping and destination. The regulations also provide that every dealer, wholesale and retail, selling coal produced in Alberta must keep a record of the coal purchased and sold from each mine; that all coal must be sold under its registered name and that an inspector at point of shipment shall have power to inspect any coal for the purpose of ascertaining whether the coal conforms with the bill of lading. Any operator, broker or dealer who violates the law, if found guilty, is liable to a fine not exceeding $1,000 for each offense or imprisonment for a period not exceeding six months, or both.

The gist of a resolution recently passed by the local union of the United Mine Workers at Phalen provides that the provisional officers of District 26 serve notice on the operators of District 26 immediately **to terminate the present contract when it expires on Jan. 15,** that no new contract be signed which carries less than a 40 per cent increase in wages to contract workers and $2 a day increase for datal men; that the conditions pertaining at the different collieries be written in the contract, and that the contract cover the same period as the contract covering the bituminous fields in the United States.

The coal production of the mines of British Columbia during October, 1923, totals 228,293 tons, an increase over the month of September production of 46,659 tons. Of the total production for the month, the mines on Vancouver Island produced 143,020 tons, approximately 63 per cent, and 21,140 tons over the production of last month. The Nicola-Princeton mines produced 22,232 tons, which is an increase of 3,254 tons over last month's production and approximately 10 per cent of the total production. The mines in the Crow's Nest Pass district produced 63,041 tons during October, an increase of 22,265 tons over last month and approximately 27 per cent of the total production. All the mines in the province showed an increase over last month's production.

New Equipment

New Line of Small Vertical Vacuum Pumps

A new line of small vertical belt-driven vacuum pumps known as Type Fifteen, announced by the Ingersoll-Rand Company, 11 Broadway, New York, is expected to be of interest to those who require high-grade standard reciprocating dry vacuum pumps of small capacities. The wide range of sizes and the different methods of drive offer a vacuum pump to suit any need where a high vacuum is necessary. Type Fifteen vacuum pumps will pull and maintain vacuums between 28.6 in. and 29.25 in., depending on their size. In addition to the standard belt design (Fig. 1) each size is built as a self-contained electric motor outfit, using the short belt-drive arrangement or driven through pinion and internal gear. The vacuum pump and electric motor of both the short-belt and gear-driven units are mounted on a metal sub-base, so that they are not dependent on the foundation for correct alignment.

The "Constant-Level" system of lubrication used on these pumps maintains a constant-level of oil, which insures the right amount being distributed to all parts. As in the ordinary splash

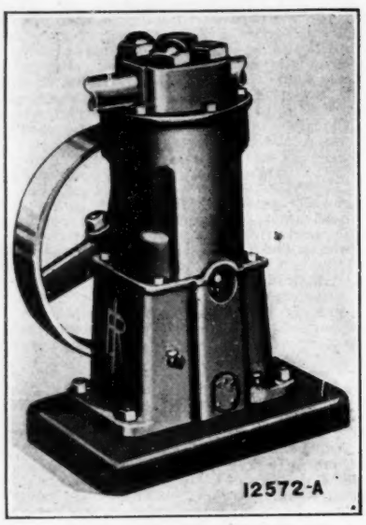


FIG. 1—BELT-DRIVEN VACUUM PUMP

These pumps are made in six different sizes—the 4x2 in.; 5x3 in.; 6x4 in.; and 8x5 in. single-acting pumps; the 10x5 in. and 12x6 in. double-acting pumps.

system, the bottom of the pump base forms an oil reservoir of sufficient capacity for the "Constant-Level" system. The amount of oil in this reservoir is determined by high and low level petcocks. Above the reservoir and directly underneath the connecting rod is a constant-level pan, as shown in Fig. 2, into which the connecting rod dips and distributes just a sufficient quantity of oil for proper lubrication. The constant-level pan is replenished

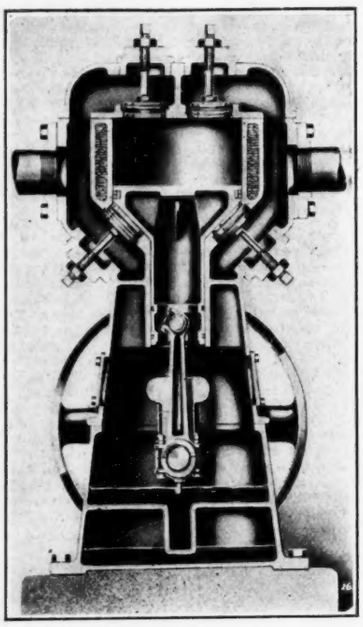


FIG. 2—SECTIONAL VIEW OF NEW VACUUM PUMP

A "constant-level" pan insures proper lubrication at all times, thus preventing scored cylinders and burned-out bearings.

with oil from the supply in the crankcase by a valveless oil pump operated by an eccentric on the main shaft. Regardless of the amount of oil in the reservoir so long as it is somewhere between the high and low level petcocks, this system will function perfectly. The lubrication of small vertical vacuum pumps employing the enclosed crankcase and splash system has often been a source of great concern. The tendency of oil systems has been to feed either too much oil, which will be carried out with the air, or too little, causing scored cylinders, overloads and burned-out bearings.

There are four sizes of single-acting pumps and two sizes of double-acting pumps. The single-acting pumps are air cooled by means of an annular ring which encircles the cylinder, while the double-acting pumps are cooled by means of circulating water.

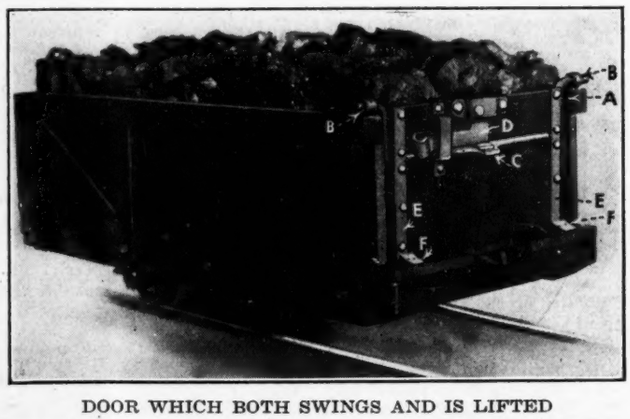
Car Door with an Ample Discharge Opening

When a car door is arranged to swing about a straight round bar joining the ends of the two sides of the car—is in short a simple pivoted, and not a lifting, endgate—the coal piled above the car body cannot get through the opening. Large lumps tend to stick and have to be barred loose, and the other lumps roll over the gate instead of sliding off the bottom, causing unnecessary breakage. Occasionally also coal spills over the side of the chute.

An endgate pivoted on the end of the car, which nevertheless gives an adequate opening for the passage of coal, is installed at the mines of the Legitt's Creek Anthracite Co., Scranton, Pa. It is made and has been patented by the Tubach Mine Car Door Co., of Dushore, Pa.

The pivot bar *A* is not straight. As may be seen in the illustration, it bends down in a U of rectangular form between the two hinges *B*. *B*. When the door opens the U swings up till upside down, raising the gate clear of the top of the car about 12 in., thus giving an opening through which all the coal can pass without barring.

Nothing remains but to describe the way in which the door is kept closed and is opened. When closed the straps, *E*, which extend below the door, catch in the stops *F*, and these keep the door tight until the handle of the latch or right-angled arm *D* is lifted. That clears the bearing plate at its angled turn, releasing the arm *C*, which forms part of the pivoting bar *A*. This enables the arm *C* to turn and so makes it possible for the whole bar to revolve on the hinges *B*. That being so the bar can rise and the door with it. The door is thus freed from the catches and is swung open and upward by the pressure of the coal. All therefore that is needed is to lift the latch *D* by the handle and tip the car over at the dump. The door them opens itself, and the coal is discharged without barring.



DOOR WHICH BOTH SWINGS AND IS LIFTED